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OAK RIDGE
NATIONAL
LABORATORY

MARTIN MARIETTA

RCRA Facilities Assessment (RFA)—Oak Ridge National Laboratory

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MANAGED BY
MARTIN MARIETTA ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

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RCRA Facilities Assessment (RFA)— Oak Ridge National Laboratory

Date of Issue—March 1987

NUCLEAR AND CHEMICAL WASTE PROGRAMS
(Activity No. KG 02 00 00 0; ONLK G02)

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Prepared by the
OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37831
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MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
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PART 2—RFA SUMMARY SHEETS

ACRONYMS

AA	alternatives assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Consolidated Fuel Reprocessing Area
CMS	corrective measures study
DM	deep monitoring
DOE	Department of Energy
DOSAR	Dosimetry Applications Research Facility
EGCR	Experimental Gas-Cooled Reactor
EIS	environmental impact statement
EPA	Environmental Protection Agency
FPDL	Fission Product Development Laboratory
FS	feasibility study
HFIR	High Flux Isotope Reactor
HPRR	Health Physics Research Reactor
HRE	Homogeneous Reactor Experiment
LLW	low-level radioactive waste
LLWDDD	Low-Level Waste Disposal and Demonstration (Program)
MRF	Metal Recovery Facility
MSL	mean sea level
MSRE	Molten Salt Reactor Experiment
NEPA	National Environmental Policy Act
NHF	New Hydrofracture Facility
NPDES	National Pollutant Discharge Elimination System
NSPP	Nuclear Safety Pilot Plant
OHF	Old Hydrofracture Facility
ORGDP	Oak Ridge Gaseous Diffusion Plant
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
PCB	polychlorinated biphenyl
PWTP	Process Waste Treatment Plant
RAP	Remedial Action Program
RCRA	Resource Conservation and Recovery Act
RFA	RCRA facility assessment
RFI	RCRA facility investigation
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
SCFP	Surplus Contaminated Facilities Program
SFMP	Surplus Facilities Management Program
STP	Sewage Treatment Plant
SWMU	Solid Waste Management Unit

SWSA	Solid Waste Storage Area
TCMP	Toxicity Control and Monitoring Program
TDHE	Tennessee Department of Health and Environment
TRE	total rare earths
TRU	transuranics
TSCA	Toxic Substances Control Act of 1976
TSF	Tower Shielding Facility
USGS	United States Geological Survey
VLF-EM	very-low-frequency eletromagnetic
WAG	waste area grouping
WIPP	Waste Isolation Pilot Plant
WOC	White Oak Creek
WOL	White Oak Lake

LIST OF ELEMENTS

Ag	silver	Mo	molybdenum
Am	americium	N	nitrogen
At	astatine	Na	sodium
Ba	barium	Ni	nickel
Be	beryllium	Np	neptunium
C	carbon	P	phosphorous
Ca	calcium	Pb	lead
Cd	cadmium	Po	polonium
Ce	cerium	Pu	plutonium
Cl	chlorine	Ra	radium
Cm	curium	Rb	rubidium
Co	cobalt	Ru	ruthenium
Cr	chromium	Sb	antimony
Cs	cesium	Sc	scandium
Cu	copper	Se	selenium
Eu	europium	Sr	strontium
Fe	iron	Tc	technetium
^3H	tritium	Th	thorium
Hg	mercury	U	uranium
I	iodine	V	vanadium
K	potassium	Xe	xenon
Li	lithium	Y	yttrium
Mg	magnesium	Zn	zinc
Mn	manganese	Zr	zirconium

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ABSTRACT

U.S. Department of Energy (DOE) facilities are required to be in full compliance with all federal and state regulations. In response to this requirement, the Oak Ridge National Laboratory (ORNL) has established a Remedial Action Program (RAP) to provide comprehensive management of areas where past and current research, development, and waste management activities have resulted in residual contamination of facilities or the environment.

The initial ORNL remedial action strategy was based on the guidance of DOE Orders 5820.2 (Surplus Facilities Management) and 5480.14 [Comprehensive Environmental Restoration, Compensation, and Liability Act (CERCLA)]; the Resource Conservation and Recovery Act (RCRA) was believed to apply only to a limited number of sites. In a memorandum from the Environmental Protection Agency (EPA) to DOE in April 1986, EPA elected to enforce regulatory requirements for ORNL remedial actions through its amended RCRA authority.

As the initial step in identifying compliance requirements, a complete listing of all known active and inactive waste management areas, contaminated facilities, and potential sources of continuing releases to the environment was prepared. Because of the large number of sites on the list (around 250), ORNL has proposed that the sites be combined into 20 Waste Area Groupings (WAGs), each of which contains sites within geographically contiguous and/or hydrologically defined units. The WAG concept was developed to subdivide the remedial action sites into manageable units that could be handled separately.

This report represents the RCRA Facility Assessment (RFA) required to meet the requirements of RCRA Section 3004(u). Included in the RFA are (1) a listing of all sites identified at ORNL that could be considered sources of releases or potential releases; (2) background information on each of these sites, including location, type, size, period of operation, current operational status, and information on observed or potential releases (as required in Section II.A.1 of the RCRA permit); (3) analytical results obtained from preliminary surveys conducted to verify the presence or absence of releases from some of the sites; and (4) ORNL's assessment of the need for further remedial attention.

1. INTRODUCTION

U.S. Department of Energy (DOE) facilities are required to be in full compliance with all federal and state environmental regulations. In response to this requirement, the Oak Ridge National Laboratory (ORNL) has established a Remedial Action Program (RAP) to provide comprehensive management of areas where past and current research, development, and waste management activities have resulted in residual contamination of facilities or the environment (Trabalka and Myrick, in press). The primary objective of the RAP is to ensure that releases of hazardous and radioactive wastes do not threaten human health or the environment. A three-plant joint planning effort is currently under way under RCRA 3004(v) to evaluate off-site contamination resulting from releases from Martin Marietta Energy Systems, Inc., facilities. This effort is separate from the activities being conducted under 3004(u) that are discussed in this report.

The initial ORNL remedial action strategy was based on the guidance of DOE Orders 5820.2 (Surplus Facilities Management) and 5480.14 [Comprehensive Environmental Restoration, Compensation, and Liability Act (CERCLA)]; the Resource Conservation and Recovery Act (RCRA) was believed to apply only to a limited number of sites. In a memorandum from the Environmental Protection Agency (EPA) to DOE in April 1986, EPA elected to enforce regulatory requirements for ORNL remedial actions through its amended RCRA authority (Scarbrough 1986a).

As the initial step in identifying compliance requirements, a complete listing of all known active and inactive waste management areas, contaminated facilities, and potential sources of continuing releases to the environment was prepared (Table 1.1). Although some of these sites would not be regulated under RCRA Section 3004(u) (e.g., Surplus Facilities), they were included in the site list to maintain a comprehensive inventory of all ORNL sites that might require some sort of remedial action. Table 1.2 contains a listing of additional Solid Waste Management Units (SWMUs) that will be evaluated during the next 6 months and will be included in an addendum to the RCRA Facilities Assessment (RFA).

Because of the large number of sites on the list (around 250), ORNL has proposed that the sites

Table 1.1. **Solid waste management sites at ORNL**[a]

1.0 Main Plant Area

- 1.1 Mercury Contaminated Soil (3503)
- 1.2 Mercury Contaminated Soil (3592)
- 1.3 Mercury Contaminated Soil (4501)
- 1.4 Mercury Contaminated Soil (4508)
- 1.5a–w LLW Lines and Leak Sites [Contamination in many inactive lines and in soil at 23 leak sites.]
  - a = Bldg. 3020, South
  - b = Bldg. 3020, East
  - c = Bldg. 3082, West
  - d = Bldg. 3019, North
  - e = Bldg. 3019, Southwest
  - f = Bldg. 3110, Between W-5 and WC-19
  - g = Bldg. 3047, Underneath
  - h = General Isotopes Area (3037, 3038, 3034)
  - i = Bldg. 3092 Area
  - j = Bldg. 3026, Underneath
  - k = Bldg. 3024, Between WC-1 and WC-5
  - l = Bldg. 3085, ORR Pump House
  - m = Bldg. 3028
  - n = Bldg. 2531, East
  - o = Bldg. 3515, Underneath
  - p = Bldg. 3525, To a Sump
  - q = Bldg. 3550, Underneath
  - r = Bldg. 3500, Sewer
  - s = Abandoned Line, Central Avenue
  - t = Bldg. 4508, North
  - u = Bldg. 3518, West
  - v = Northwest of SWSA-1
  - w = Bldg. 3503, Ground Contamination
- 1.6 Contaminated Surfaces and Soil from 1959 Explosion in Bldg. 3019 Cell
- 1.7 Contamination at Base of 3019 Stack
- 1.8 Graphite Reactor Storage Canal Overflow (3001/3019)
- 1.9 Oak Ridge Research Reactor Decay Tank Rupture Site (3087)
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- 1.11 Decommissioned Waste Holding Basin (3512)
- 1.12 Waste Holding Basin (3513)
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- 1.14 Process Waste Pond (3539)
- 1.15 Process Waste Pond (3540)
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- 1.17 Sewage Aeration Pond (West) (2544)
- 1.18 Coal Pile Settling Basin (2545)
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- 1.20 3517 Filter Pit (Fission Product Development Laboratory)—(3517)
- 1.21 FPDL LLW Transfer Line
- 1.22 Isotopes Ductwork/3110 Filter House
- 1.23 Inactive LLW Waste Collection/Storage Tanks (W-1, W-2)
  - a = W-1
  - b = W-2

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1.24 Inactive LLW Waste Collection/Storage Tanks (W-3, W-4)
a = W-3
b = W-4
1.25 Inactive LLW Waste Collection/Storage Tanks (W-13, W-14, W-15)
a = W-13
b = W-14
c = W-15
1.26 Inactive LLW Waste Collection/Storage Tanks (W-5, W-6, W-7, W-8, W-9, W-10)
a = W-5
b = W-6
c = W-7
d = W-8
e = W-9
f = W-10
1.27 Inactive LLW Waste Collection/Storage Tank (W-11)
1.28 Inactive LLW Waste Collection/Storage Tank (W1-A)
1.29 Inactive LLW Waste Collection/Storage Tank (WC-1)
1.30 Inactive LLW Waste Collection/Storage Tanks (WC-15, WC-17)
a = WC-15
b = WC-17
1.31 Inactive LLW Waste Collection/Storage Tanks (TH-1, TH-2, TH-3)
a = TH-1
b = TH-2
c = TH-3
1.32 Inactive LLW Waste Collection/Storage Tank (TH-4)
1.33 Active LLW Waste Collection Tank (2026)
1.34 Active LLW Waste Collection Tank (WC-2)
1.35 Active LLW Waste Collection Tank (WC-3)
1.36 Inactive LLW Waste Collection Tank (WC-4)[b]
1.37 Active LLW Waste Collection Tanks (WC-5, WC-6, WC-8, WC-9)
a = WC-5
b = WC-6
c = WC-8
d = WC-9
1.38 Active LLW Waste Collection Tank (WC-7)
1.39 Active LLW Waste Collection Tanks (WC-10, WC-11, WC-12, WC-13, WC-14)
a = WC-10
b = WC-11
c = WC-12
d = WC-13
e = WC-14
1.40 Active LLW Waste Collection Tank (WC-19)
1.41 Active LLW Waste Collection Tank (W-12)
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a = W-16
b = W-17
c = W-18
1.43 Active LLW Waste Collection/Storage Tanks (W-21, W-22)
a = W-21
b = W-22

Table 1.1 (continued)

1.44 Active LLW Waste Concentrate Tank (W-23)
1.45 Active LLW Waste Concentrate Storage Tanks (C-1, C-2)
  a = C-1
  b = C-2
1.46 SWSA-1 (2624)
1.47 SWSA-2 (4003)
1.48 Low-Level Waste Evaporator (2531)
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1.50 PCB Storage Area (2018N)
1.51 Process Waste Treatment Plant (3544)
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2.1 White Oak Lake and Embayment (7846)
2.2 White Oak Creek and Tributaries (0853)

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3.1 SWSA-3 (1001)
3.2 Closed Scrap Metal Area (1562)
3.3 Contractors' Landfill (1554)

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4.1 Low-Level Waste Line North of Lagoon Road (7800N)
4.2 Pilot Pits 1, 2 (7811)
4.3 SWSA-4 (7800)

5.0 Solid Waste Disposal Area 5

5.1a,b LLW Lines and Leak Sites
  a = OHF, Release of Grout
  b = Bldg. 7852—Hydrofracture Injection Area, South
5.2 Old Hydrofracture Facility (OHF) Pond (7852A)
5.3 OHF Site Surface Facilities (7852)
5.4 New Hydrofracture Site (NHS) Surface Facilities (7860)
5.5 OHF Waste Storage Tanks (T1, T2, T3, T4, T9)
  a = T1
  b = T2
  c = T3
  d = T4
  e = T9
5.6 Process Waste Sludge Basin (7835)
5.7 SWSA-5 (7802)

Table 1.1 (continued)

5.8 LLW Waste Concentrate Storage Tanks (W-24, W-25, W-26, W-27, W-28, W-29, W-30, W-31)
a = W-24
b = W-25
c = W-26
d = W-27
e = W-28
f = W-29
g = W-30
h = W-31
5.9 Radioactively Contaminated Waste-Oil Storage Tank (7860A)
5.10 TRU Waste Storage Area

6.0 Solid Waste Disposal Area 6

6.1 SWSA-6 (7822)
6.2 Emergency Waste Basin (7821)
6.3 Explosives Detonation Trench (7822A)

7.0 LLW Pits and Trenches Area

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7.2 Homogeneous Reactor Experiment (HRE) Fuel Wells (7809)
7.3 Hydrofracture Experimental Site 1, Soil Contamination (HF-S1A)
7.4a,b,c Site 30—Gauging Stations NW of Bldg. 7852
a = Hydrofracture No. 1, Release of Grout
b = Pit 6—Southeast
c = End of Trench 7 Access Road
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a = 7806
b = 7807
c = 7808
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7.8 Trench 6 (7810)
7.9 Trench 7 (7818)
7.10 Shielded Transfer Tanks (ST1, ST2, ST3, ST4, ST5)

8.0 Melton Valley Area

8.1a–d HFIR/TRU Waste Collection Basins (7905, 7906, 7907, 7908)
a = 7905
b = 7906
c = 7907
d = 7908
8.2 Hydrofracture Experimental Site 2, Soil Contamination (HF-S2A)
8.3a–g LLW Line and Leak Sites—Melton Valley Drive Area
a = Melton Valley Drive
b = Melton Valley Drive and SWSA-5 Access Road
c = 7500 Area
d = West of Melton Valley Pumping Station
e = Bldg. 7920 and Melton Valley Pumping Station Area
f = Bldg. 7920 Ditch Line
g = The Melton Valley Transfer Line

Table 1.1 (continued)

8.4 Hazardous Waste Storage Facility (7507)
8.5 Active LLW Collection and Storage Tank (WC-20)
8.6 Active LLW Collection/Storage Tank (HFIR)
8.7 Active LLW Collection/Storage Tanks (T-1, T-2)
a = T-1
b = T-2
8.8 Mixed Waste Storage Pad (7507W)
8.9 Sewage Treatment Plant (7904)
8.10 Silver Recovery Process (7834)

9.0 Homogeneous Reactor Experiment (HRE) Area

9.1 HRE Pond (7556)
9.2 LLW Collection and Storage Tanks (7560, 7562)
a = 7560
b = 7562
9.3 Septic Tank (7501)

10.0 Hydrofracture Injection Wells and Grout Sheets

10.1 Hydrofracture Experimental Site 1 (HF-S1)
10.2 Hydrofracture Experimental Site 2 (HF-S2)
10.3 Old Hydrofracture Facility (7652)
10.4 New Hydrofracture Facility (7860)

11.0 White Wing Scrap Yard

11.1 White Wing Scrap Yard (XC0751)

12.0 Closed Contractors' Landfill

12.1 Closed Contractors' Landfill (7658)

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13.1 Cesium-137 Contaminated Field (0800)
13.2 Cesium-137 Erosion/Runoff Study Area (0807)

14.0 Tower Shielding Facility (TSF)

14.1 TSF Scrap Yard (7702)
14.2 Septic Tank (7750)

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15.1 Cyclotron Z-Oil (9201-2)
15.2 Transformers (9201-2, 9204-1, 9204-3, SY200 Yard)

16.0 Health Physics Research Reactor Area

16.1 Cesium-137 Forest Research Area (7759)
16.2 Process Waste Basin (7711)

Table 1.1 (continued)

17.0 ORNL Service Area

17.1 Septic Tank (7000)
17.2 Waste Oil Storage Tanks (7002W, 7009E, 7075, 7021E)
a = 7002W
b = 7009E
c = 7075
d = 7021E
17.3 Waste Oil Storage—Mobile Truck (7030E)
17.4 Photographic Reproduction Waste Storage Tanks (7075A, 7075B)
a = 7075A
b = 7075B

18.0 Consolidated Fuel Reprocessing Area

18.1 EGCR Ponds (7600A, 7600B)
a = 7600A
b = 7600B
18.2 Paint Solvents Storage (7615)
18.3 Septic Tank (7616)
18.4a–d Waste Acid Storage Tanks (7602, 7601)
a = 7602a
b = 7602b
c = 7602c
d = 7601
18.5 Waste Retention Basin (7613)

19.0 Hazardous Waste Treatment and Storage Facilities

19.1 Hazardous Waste Storage Facility (7652)
19.2 Chemical Waste Storage and Cylinder Area (7653)
19.3 Long-Term Hazardous Waste Storage Facility (7654)
19.4 Mixed Waste Storage Facility (7651)
19.5 Leaking Gas Cylinder Area (7659A)
19.6 Reactive Chemicals Disposal Area (7659B)

20.0 Oak Ridge Landfarm

20.1 Municipal Sewage Sludge Application Site (XF1226)

Non-SWMU (Solid Waste Management Unit) remedial action sites

1.0 Main Plant Area

1A.1 Graphite Reactor (3001)
1A.2 Low Intensity Test Reactor (3005)
1A.3 Oak Ridge Research Reactor (3042)
1A.4 Cobalt-60 Storage Garden (3029)
1A.5 Fission Product Development Laboratory (3517)
1A.6 Fission Product Pilot Plant (3515)
1A.7 Metal Recovery Facility (3505)
1A.8 Storage Garden (3033)
1A.9 Strontium-90 Power Generators (3028)

Table 1.1 (continued)

1A.10	Waste Evaporator Facility (3506)
1A.11	Ceramic Processing Laboratory (4508)
1A.12	High-Level Chemical Development Laboratory (4507)
1A.13	Remote Coating Furnace Loop (4508)
1A.14	Transuranium Research Laboratory 45 (5505)
1A.15	High-Level Radiochemical Analytical Laboratory (3019B)
1A.16	Oak Ridge Research Reactor Heat Exchanger (3087)
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15A.3	Contaminated East End Basement (9204-1)
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15A.5	Radioisotope Processing Facility (Beta Cubicle)—(9204-3)
15A.6	Radioisotope Processing Facility (Curium Handling Glovebox)—(9204-3)
15A.7	86-Inch Cyclotron (9201-2)
15A.8	Plutonium Process Condensate Tank (9204-3)
15A.9	Plutonium Processing Facility (9204-3)
15A.10	Coolant Salt Technology Facility (9201-3)
15A.11	MSRE Fuel Handling Facility (9201-3)

[a]*Inactive* refers to tanks no longer receiving new waste additions; most are still storing liquid wastes and/or sludges. *Active* refers to tanks which still are in use for waste collection and storage of newly generated wastes.

[b]Tank is not in use but has yet to be included in the Remedial Action Program as an inactive site.

be combined into 20 Waste Area Groupings (WAGs), each of which contains sites within geographically contiguous and/or hydrologically defined units (Fig. 1.1). The WAG concept was developed to subdivide the remedial action sites into manageable units that could be handled separately. The ORNL area is characterized by complex hydrogeologic conditions, and previous studies have shown that a strong coupling generally exists between the shallow groundwater and surface drainage systems. Reliance on groundwater monitoring as prescribed by a narrow interpretation of RCRA regulations is not considered to be the most effective means for detecting contaminant release for ORNL site conditions; rather, a combination of surface water and groundwater monitoring is thought to be more effective in meeting the principal performance objective of RCRA regulations: the protection of human health and the environment (Trabalka and Myrick, in press).

Table 1.2. Addendum to ORNL SWMU listing

WAG 1	1.36	Inactive LLW Waste Collection Tank (WC-4)
	1.55	Septic Tank for Building 5505 (5507)
	1.56a,b	Inactive LLW Waste Collection Tanks (W-19, W-20)
WAG 5	5.11	Septic Tank (7831)
	5.12	Septic Tank (7860)
	5.13	Septic Tank (7853)
WAG 7	7.11	Septic Tank (7819)
	7.42	Transfer Line from Decontamination Facility to Pit 1
WAG 9	9.4	Septic Tank (7503)
WAG 16	16.3	Buried Scrap Metal
	16.4	Septic Tank (7709)
	16.5	Septic Tank (7710)
WAG 17	17.5	Abandoned Burn Pit—Near Sanitary Waste Compactor (0904)
	17.6	Septic Tank (0907) at Katy's Kitchen
WAG 19	19.7	Soil Injection of Radioactive Gas (7659c)
	19.8	Explosive and Shock Sensitive Waste Detonation Facility (New)

Non-SWMU environmental research areas

1. Ca-45 tagged trees
2. Ca-45 tagged soil and vegetation
3. Na-22 contaminated soil
4. Cs-137 litter bags
5. Hg-197 tagged stream
6. Cs-134 tagged tree
7. Ca-45 tagged forest
8. Cs-137, Fe-59 contaminated animal pens (McNew Hollow)
9. Hg-203 tagged stream
10. H-3 contaminated trees
11. Cs-137, Co-60 contaminated forest area
12. Cs-134 contaminated oak trees
13. Zn-65 tagged red oak seedlings
14. Cs-134 contamianted pine and oak seedlings
15. Rb-86 contaminated plants
16. Cs-134 contaminated soybean and sorghum
17. Cs-134 contaminated grasses
18. Cs-134 contaminated lichens and mosses
19. Tc-95m contaminated soil and plants
20. Tc-95m uptake studies
21. Tc-95m and I-131 contaminated pasture

Table 1.2 (continued)

22. Cr-51 contaminated grass plots
23. Tc-99 and Np-237 contaminated soil lysimeters
24. Cs-137 contaminated forest floor
25. Cs-137 contaminated forest understory
26. Cs-137 contaminated meadow
27. Cs-134 contaminated persimmon tree
28. Co-60 and Mn-54 animal study
29. C-14 maintenance-respiration study
30. C-14 sucrose inoculation of oak and pine trees
31. C-14 allocation in white oak trees
32. C-14 allocation in white pine trees
33. C-14 efflux in yellow-poplar stand
34. C-14 allocation in woody biomass plantation species

In the approach suggested by ORNL, *WAGs are generally defined by watersheds that contain contiguous and similar assemblages of operating facilities and remedial action sites, including waste management units.* There are a few areas where potential SWMUs are isolated from the major waste area grouping. These individual sites are considered separately instead of expanding the area of the WAG, which could cause excessive distances between the SWMU and the nearest monitoring point. Although some WAGs may share common boundaries, *each WAG represents distinct small drainage areas within which similar contaminants were introduced.* In some cases, there has been hydrologic interaction among the units within a WAG, thus making some units hydrologically inseparable. Grouping waste management units allows perimeter monitoring of both groundwater and surface water at inflow and discharge points for each hydrologic entity (i.e., a WAG) in a time frame that is much shorter than that required to isolate and define each unit individually. This allows a response that protects human health and the environment to be developed in an appropriate time period. Based on such monitoring data, further studies principally directed toward the groundwater subsystem can address individual sites or units within a WAG, as well as contaminant plumes that extend beyond the perimeter of the WAG (Trabalka and Myrick, in press).

1.1 PURPOSE OF THIS REPORT

As currently implemented, the RCRA Section 3004(u) corrective action program consists of four phases (EPA 1986a):

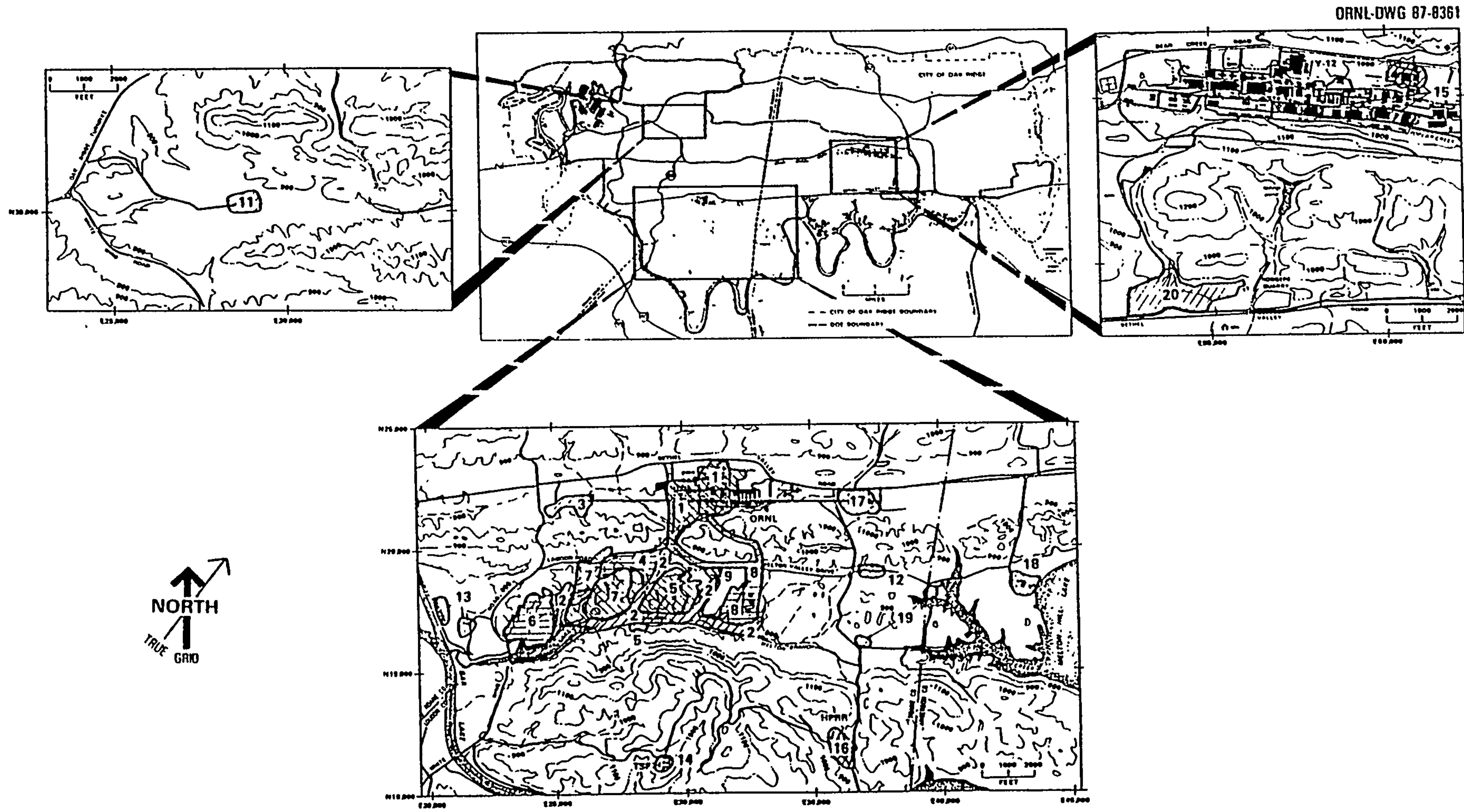

Fig. 1.1. Locations of the 20 Waste Area Groupings (WAGs).

1. The RCRA Facility Assessment (RFA) to identify releases or potential releases requiring further investigation.

2. The RCRA Facility Investigation (RFI) to fully characterize the extent of releases.

3. Corrective Measures Study (CMS) to determine the need for and extent of remedial measures. This step includes the selection of appropriate remedies for all problems identified.

4. Corrective Measures Implementation to design, construct, operate, maintain, and monitor the performance of the measure(s) selected.

This report represents the RFA required to meet the requirements of Section 3004(u). Included in the RFA are (1) a listing of all sites identified at ORNL that could be considered sources of releases or potential releases; (2) background information on each of these sites, including location, type, size, period of operation, current operational status, and information on the type of wastes present and observed or potential releases (as required in Section II.A.1 of the RCRA permit); (3) analytical results obtained from preliminary surveys conducted to verify the presence or absence of releases from some of the sites; and (4) ORNL's assessment of the need for further remedial attention.

The format of the report (volumes 1 and 2) is as follows. In Part 1 of Volume 1, Sects. 1 and 2 provide background on compliance activities at ORNL and descriptive material on waste management operations. Section 3 describes the WAGs and the associated Solid Waste Management Units (SWMUs), providing brief information on the geology and hydrology of the site, results of preliminary sampling studies performed to determine if the WAG (or any of its SWMUs) is a source of release (either at the present time or in the future), and recommendations regarding the need for further studies [remedial investigation (RI)] for the WAG. Section 4 summarizes the status of the WAGs and the individual SWMUs, provides proposed schedules for RI plan preparation, and describes the proposed implementation of the Remedial Action Program in response to the corrective action requirements of RCRA Section 3004(u). Part 2 of Volume 1 contains the summary sheets requested by EPA under Section II.A.1 of the RCRA permit for the ORNL Hazardous Waste Storage Facility (Building 7652). Volume 2 contains the topographic maps of appropriate scale that show the locations of all SWMUs. These maps are accompanied by title sheets that show how SWMUs have been assinged to WAGs. The maps are organized by WAG, and the WAG boundaries are shown in addition to the SWMU locations.

1.2 RATIONALE FOR IDENTIFYING RELEASES

Many of the identified SWMUs have released radioactive materials to the environment because of leaks, spills, or migration of leachates. A typical example is radionuclide migration from the Solid Waste Storage Areas (SWSAs). A considerable amount of information exists on the overall releases from many of the WAGs; however, information on the presence or absence of releases from individual SWMUs is not as common. Some of the existing underground facilities may be sources of release or potential release in the future, but few or no data exist on which to base this judgment. In many cases, only when radioactivity is found during routine excavation or when monitoring levels increase at points within the waste collection or treatment systems is there any indication that a leak has occurred. When a leak or spill has been identified, normal corrective actions will include repair of the leak and removal of contaminated soil. However, in some instances all of the contamination cannot be removed because of employee radiation safety considerations. In these instances, some of the contamination remains and could represent a potential for future release. In the case of tank leaks, it has been necessary to discontinue use of the tank (but not remove it), repair the leak, or remove the tank contents. The contamination remaining in these tanks could represent a potential source of release.

In other instances, a release such as a leak in an underground low-level radioactive waste (LLW) pipeline has produced increased activity levels in other waste systems at some point far from the actual location of the leak. The mechanism for this phemonenon may be the movement of contaminants through the backfill material in the pipeline trenches, followed by infiltration into the piping of the other systems. Thus, a leak in one system can produce contaminant transfer to other systems. Even when the leak is repaired, it is essentially impossible to completely halt the release of contaminants to the other systems because the infiltration could be occurring anywhere downslope from the original leak.

1.3 WAG PRELIMINARY SURVEYS

To evaluate the potential for past releases, a surface water contaminant survey was performed on each of the 20 WAGs. RCRA regulatory guidance is based on the use of groundwater sampling as the measure of compliance (Trabalka and Myrick, in press). However, ORNL does not have monitoring wells in or around the perimeter of many of the WAGs, and most of the installed wells are not constructed to provide suitable RCRA-quality samples. Furthermore, due to budgetary and manpower constraints, it was not possible to install groundwater monitoring wells at each of the WAG perimeters prior to preparing this RFA. However, it is generally known that the uppermost aquifer discharges to surface streams in the WAGs. As a result, stream sampling and analysis techniques developed by Cerling and Spalding (1981) were used to provide information on releases from each of the 20 WAGs.

Cerling and Spalding (1981) developed a screening technique using stream gravels, muds, and water samples to identify the presence of contaminants in streams or drainage channels. Their technique is based on the ability of coatings on stream gravels to sorb metals and radionuclides or muds to sorb organics from water. The presence of these contaminants on extracts from the gravel or mud samples indicates that the contaminant may be currently present in the water passing the site or that a release occurred some time in the past. Sampling of the stream water can verify if the contaminant is present at the time the gravel and mud samples were taken. One advantage of this approach is that the gravels and mud samples can be taken in stream beds even if there is no water flowing at the time. Because the sediments act to integrate and concentrate indicator contaminants, this approach is also much more sensitive than standard water quality analysis methods.

Using these techniques, stream surveys were performed in 1978 and 1985 to establish sources of contamination in the White Oak Creek (WOC) watershed (Cerling and Spalding 1981; Cerling 1986). Based on the results of these surveys, it is apparent that WAGs 1 through 9 represent a source of release of radionuclides to the environment and that some of these nine WAGs probably also can be considered a source of some hazardous contaminants (Cerling 1986). At the time the 1985 survey was performed, ORNL had not been informed that the regulatory authority of Section 3004(u) would be applied, and as a result the areas represented by WAGs 11 through 20 were not surveyed (WAG 10 encompasses the injection wells and grout sheets from the hydrofracture facilities, and the stream gravel technique is not applicable).

Based on an understanding of the hydrology of the ORNL area, the stream gravel technique of Cerling and Spalding (1981) was used to provide an indication of past or present releases from the identified WAGs within the required time schedule for the RFA. The results of the preliminary survey conducted in 1986 are included in the WAG descriptions that follow and are used to provide insight about the possibility of releases occurring from SWMUs within the WAG.

One of the major features of the WAG concept is detection of groundwater transport of hazardous constituents at the WAG perimeter. Based on an evaluation of the groundwater flow system at each WAG, monitoring wells are being placed at all points on the WAG perimeter where groundwater flow from SWMUs could result in contaminant transport from the WAG. Where such transport is detected, additional investigations will determine which SWMUs are responsible, and more monitoring wells will be provided. This stepwise program ensures that all SWMUs that contribute to the release of hazardous constituents across WAG perimeters will receive adequate monitoring and attention. Because previous studies have shown that the uppermost aquifers discharge to streams within or adjacent to the WAG boundaries, the stream gravel sampling techniques will continue to be implemented as a monitoring technique for the WAGs. Thus, ORNL proposes to continue to monitor the WAGs using a combination of surface and groundwater sampling supplemented by periodic stream gravel surveys.

2. DESCRIPTION OF WASTE MANAGEMENT AT ORNL

2.1 BACKGROUND

Operations at ORNL began in 1943 with construction of a reactor pilot model for the Hanford, Washington, production plant. The Graphite Reactor, a chemical separations plant, and a number of large underground concrete (gunite) tanks for waste storage were constructed initially. The tanks were intended to store all of the radioactive liquid chemical waste and the liquid uranium waste accumulated during the life of ORNL (estimated to be one year) (Browder 1959). Expansion of the scope of work undertaken at ORNL increased the amount of waste produced, and alternatives to tank storage were required.

ORNL's major efforts since 1943 have included research and development activities related to the reprocessing of nuclear reactor fuels, production of isotopes for medical and industrial applications, and significant basic and applied research efforts in both nuclear and nonnuclear areas. The liquid and solid wastes generated as a result of these efforts (both radioactive and nonradioactive) have been treated, disposed of, or stored as a part of routine laboratory operations. Over time, the required waste management operations have resulted in the installation of a number of underground storage tanks, waste treatment facilities, waste impoundments, and solid waste storage (disposal) facilities within the ORNL plant area and in the environs surrounding the plant. Also, as a result of routine waste management operations a number of spills and leaks have occurred that contaminated soil with both radioactive and nonradioactive contaminants.

2.1.1 Liquid Wastes

Three separate waste collection, treatment, and disposal systems are provided at ORNL to handle (1) low-level radioactive waste, (2) process waste, and (3) domestic sewage. Additionally, a system of pipes and open ditches is used to collect and direct storm water to WOC. Although laboratory procedures have been developed for defining the waste management system to be used for each type of waste, evidence indicates that there may have been, or still may be, some wastes that have been accidently discharged to the wrong system. Also, although radioactive materials (above certain contaminent levels) should not be directed to systems other than low-level waste, the presence of radioactivity in the chemical and sewage system has been routinely observed, indicating that either some drains are connected to the wrong system, that laboratory practices are not being followed, or that deterioration of pipe materials and joints has resulted in leakage of waste from the pipeline and/or infiltration of contaminated groundwater into the system.

2.1.1.1 Low-level waste

Initially, liquid radioactive waste was stored in underground gunite tanks (Browder 1959). Later, when storage capacity was exhausted, the incoming waste was precipitated in the gunite tanks, and the supertant was diluted with process wastewater and discharged to White Oak Creek. A 1.5M-gal (5.7M-L) waste holding pond was constructed in 1943 to allow decay of shorter half-life radionuclides prior to discharge. In 1943, a dam was built across WOC to create a controlled area for the discharge of wastes and to increase the holding time prior to release. From 1943 to 1949, chemical precipitation followed by impoundment was practiced as a means of reducing the radioactivity ultimately released and diluted in the Clinch River. These operations resulted in the production of sludges in the waste collection tanks, the holding basin, and in White Oak Creek and White Oak Lake.

From June 1949 until June 1954, liquid radioactive wastes were concentrated by evaporation (with the condensate released to the waste holding basin and then WOC), and the concentrate was stored in the gunite tanks. This operation continued until 1954 when the evaporator was taken out of service and the LLW was transferred to seepage pits for disposal. This practice continued until 1966, when a new evaporator was installed and the concentrate was disposed of by hydrofracture. The hydrofracture facility was also used to inject some of the sludges from the underground storage tanks. At the present time, there are no plans to continue hydrofracturing of the LLW.

Currently, LLW is collected and evaporated, and the condensate is released to the process waste system. Some of the buildings at ORNL have waste collection tanks located nearby to serve as temporary storage facilities for the LLW until it can be transferred to the waste evaporator. Evaporator concentrates are transferred to the Melton Valley waste storage tanks. At this time, no alternative solution is available for disposal of the LLW; however, R&D studies related to solidification of the LLW are under way.

2.1.1.2 Process waste

Process waste is wastewater from laboratory sinks marked "Process Waste," floor drainage, steam condensate from heating coils in vessels containing radioactive solutions, cooling water from process equipment, rainwater runoff from potentially contaminated areas, and condensate from the low-level evaporator. Wastes released to the process waste system must contain radioactivity below prescribed levels (ORNL Environmental Protection Manual, EPM-18.0, 1985). No liquids containing hazardous materials, oils, carcinogenic materials, etc., are to be disposed of in the process waste system.

About 40% of the process waste is diverted to a number of holding basins (3539, 3540, 7905, 7906, 7907, and 7908 ponds) prior to treatment or release. After sampling and analysis for pH and radioactivity, the waste is either released to WOC or diverted to the 3524 Equalization Basin at the Process Waste Treatment Plant (PWTP, 3544). The remaining 60% of the process waste generated flows directly into 3524 and is tested by the PWTP. Sludges produced during the treatment of process waste were first directed to the waste seepage pits and later to the hydrofracture operation for disposal.

2.1.1.3 Domestic sewage

Biodegradable nonhazardous materials, sewage, and associated wastewater are collected and treated at the ORNL Sewage Treatment Plant (STP); remote facilities employ individual septic tanks. Initially, the STP consisted of sedimentation, sludge digestion, and sludge drying beds. In 1974, two aerated lagoons were installed to treat the sewage. In 1986, an extended-areation sewage treatment plant was installed to achieve compliance with the ORNL National Pollutant Discharge Elimination System (NPDES) permit.

2.1.2 Solid wastes

A variety of solid wastes are managed at ORNL. These include low-level radioactive, TRU, hazardous, mixed, construction, and conventional wastes. Solid wastes are segregated at the source for appropriate management.

Low-level radioactive solid wastes have been buried in six SWSAs (Coobs and Gissel 1986). Currently, only one SWSA, SWSA 6 is active. Nearly all solid low-level waste that is currently buried at ORNL is disposed of in either concrete culverts or lined auger holes. These techniques provide greater confinement of radionuclides than was provided by the unlined trench disposal practiced in earlier years. Because the land available for disposal in SWSA 6 is limited, the life of the disposal facility is being extended by implementing volume reduction measures and interim storage. The Low-Level Waste Disposal Development and Demonstration (LLWDDD) program is meanwhile developing improved technologies for LLW disposal at ORNL.

TRU wastes include contact- and remote-handled categories. Starting in 1970, TRU wastes were no longer buried in the SWSAs but were retrievably stored in special facilities constructed at SWSA 5. Since that time, and with few exceptions (43 casks were buried in FY 1971 and 44 casks in FY 1972), TRU wastes have been retrievable stored (Bates 1983). Contact-handled TRU wastes are packaged in drums by the generators. The drums undergo nondestructive assay/nondestructive examination to ensure compliance with waste acceptance criteria for the Waste Isolation Pilot Plant (WIPP), to which they will be shipped. Remote-handled TRU wastes are packaged primarily in concrete casks or stainless steel cylinders and stored. Processing and repackaging of remote-handled TRU wastes will be necessary before shipment to the WIPP. Hazardous chemical wastes are collected and stored on-site in RCRA-permitted or interim status facilities. These wastes are segregated by characteristic hazard (ignitable, corrosive, etc.), packaged to meet Department of Transportation requirements, and placed in interim storage prior to shipment for treatment or disposal at off-site RCRA-licensed commercial facilities. Some categories of hazardous chemical wastes are treated on-site in RCRA interim status facilities.

Mixed radioactive and chemical wastes are stored on-site in facilities with interim status under RCRA prior to shipment to off-site RCRA disposal facilities. Incineration in the TSCA/RCRA incinerator at ORGDP is planned for the majority of the remaining mixed wastes once the incinerator becomes operational.

Noncontaminated demolition and construction wastes are buried in a contractors landfill. Fly ash from the ORNL steam plant and sludge from the coal yard runoff treatment facility are also buried in the contractors landfill.

Conventional nonradioactive solid wastes generated at ORNL are transferred to the Y-12 sanitary landfill for disposal.

Ten of the WAGs were already believed to require the full RI/FS treatment prior to completion of the RFA, and tentative dates for completion of the interim steps are given in Fig. 4.1. For the remaining ten groupings, it was planned that schedules for detailed site investigations or assessments of remedial action alternatives would be developed during preparation of the RFA. These either have been determined (WAGs 14, 16, 17, 18, and 20) or will be determined by August 1987 (WAGs 11, 12, 13, 15, and 19) during a follow-up activity to the RFA (Table 4.3). In the former case, RIs are not deemed to be necessary for WAGs other than WAG 17, and, in the latter, information is currently insufficient for WAGs 11 through 13, 15, and 19 to make a final determination whether an RI is needed.

2.1.3 Gaseous wastes

Ventilation from chemical processing facilities and cells in which radioactive materials are handled are vented to a central off-gas system. Treatment of the gases is primarily by filtration although some scrubbers are included in the overall system. Following filtration, the gases are monitored prior to stack release. Filters and scrubber solutions from the central off-gas system are handled as radioactive wastes.

3. WAG DESCRIPTIONS

About 250 potential SWMUs, as defined by RCRA Section 3004(u), have been identified at ORNL (Table 1.1). Table 3.1 lists the number of SWMUs in each WAG. Some of the WAGs (1, 5, 7, 8, and 17) contain a relatively large number (>10) of SWMUs, whereas WAGs 11, 12, and 20 contain only one SWMU (due to the geographic and hydrologic isolation of the SWMU). Table 3.1 also indicates on the basis of the total number of SWMUs in the WAG that WAG 1 represents the greatest concentration of SWMUs and, perhaps, the major concern for the ORNL Remedial Action Program. However, the number of SWMUs in the WAG is not necessarily the main indicator of the complexity of remedial actions that might be required; for example, WAG 2 (White Oak Creek/White Oak Lake) contains only two SWMUs, yet the drainage from most of the WAGs ultimately passes through this watershed.

3.1 MAIN PLANT AREA

3.1.1 Location and Description of WAG 1

WAG 1, the ORNL main plant area, contains about one half of the SWMUs identified to date by the ORNL Remedial Action Program (Table 3.1). Most of the SWMUs are sites used to collect and store LLW; the SWMUs also include spill and leak sites detected over the past 40 years (see Table 1.1). Because of the relatively small size of the WAG and the large number of SWMUs, there is a high probability that it will not be possible to isolate or separate SWMUs that have caused releases from those that have not. Figure 3.1 shows the location of the SWMUs in WAG 1.

In developing the summary sheets for each of the SWMUs (Part 2), it has been assumed that, by definition, a leak or spill site represents a point of release; however, because of the nature of the cleanup or repair it is not currently possible to determine if the site still represents a source of future release.

Many types of SWMUs (tanks, ponds, waste treatment facilities, leak/spill sites, landfills) listed by EPA in the definition of a SWMU are included in WAG 1 (Table 3.2). Most of the SWMUs are related to ORNL's liquid and solid radioactive waste management operations, and information on hazardous waste constituents for most of these units is nonexistent. Additional details on WAG 1 are included in the Environmental Data Package developed for WAG 1 (Boegly et al. 1987).

Table 3.1. Waste Area Groupings—site summaries

WAG number and description	Number of sites
1.0 Main Plant Area	99
2.0 White Oak Creek/White Oak Lake	2
3.0 SWSA 3	3
4.0 SWSA 4	3
5.0 SWSA 5	25
6.0 SWSA 6	3
7.0 LLW Pits and Trenches Area	15
8.0 Melton Valley Area	20
9.0 Homogeneous Reactor Experiment (HRE) Area	6
10.0 Hydrofracture Injection Wells and Grout Sheets	4
11.0 White Wing Scrap Yard	1
12.0 Closed Contractors' Landfill	1
13.0 Environmental Research Areas	2
14.0 Tower Shielding Facility (TSF)	2
15.0 ORNL Facilities at Y-12 Plant	5
16.0 Health Physics Research Reactor Area	5
17.0 ORNL Services Area	10
18.0 Consolidated Fuel Reprocessing Area	9
19.0 Hazardous Waste Treatment and Storage Facility	7
20.0 Oak Ridge Land Farm	1
Total	223
Additional sites	
Surplus Contaminated Facilities	29

3.1.2 Geologic Description of WAG 1

The Oak Ridge Reservation (ORR) is located in the Valley and Ridge Physiographic Province of the Appalachian Highlands. The Valley and Ridge Province is characterized by essentially parallel and elongated, alternating valleys and ridges formed after folding and thrust faulting during the Appalachian Orogeny. Regional strike in the Oak Ridge area is N 45° to 60° E, and dip is typically about 30° southeast but can vary locally from <20° to 40°. A typical northwest to southeast cross section showing the geologic structure of the ORR is shown in Fig. 3.2. The bedrock units that underlie the main plant area consist of the limestone, siltstone, and calcareous shale facies of the Ordovician Chickamauga Group (Stockdale 1951).

For evaluations related to on-site liquid radioactive waste disposal, Stockdale (1951) conducted a geological and hydrological study of the main plant area. Fifty-one exploratory borings were completed in and around the area to depths of 50–250 ft (15–76 m), with most holes drilled to 50 or 100 ft (15 or 33 m). Most of the holes were drilled into upper Chickamauga Units H–E. Stockdale (1951) summarized the descriptions of upper Chickamauga limestones as being tightly cemented and compact with the exception of several small [roughly 1-in. (2.5-cm) thick] solution channels.

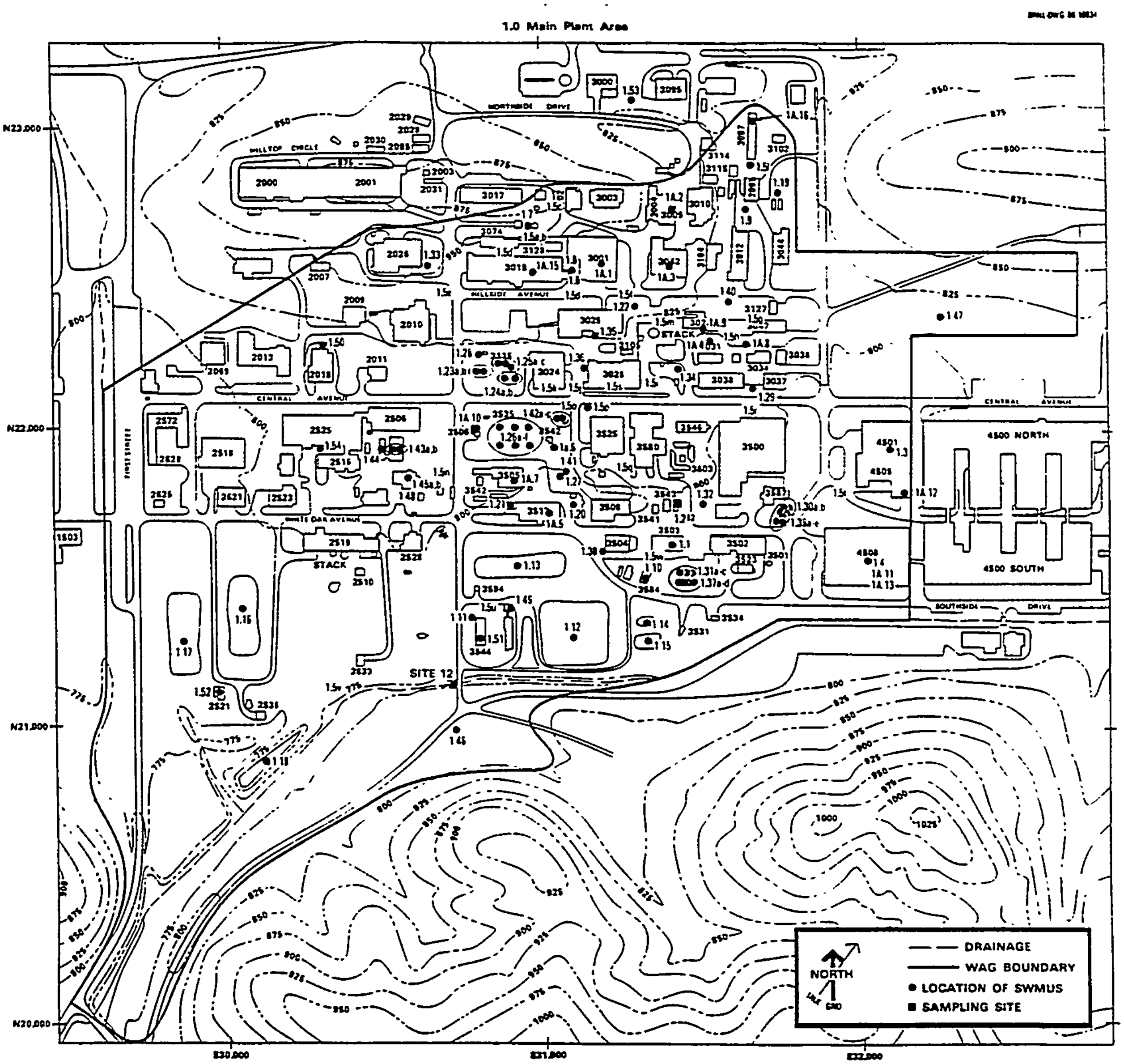

Fig. 3.1. WAG 1—Main Plant Area.

Table 3.2. WAG 1—Listing of sites by type

Type of site	Number of sites
Collection and storage tanks (LLW)	
Inactive	22
Active	24
Leak/spill sites and contaminated soils	
Radioactive	30
Chemical	4
Ponds and impoundments	
Radioactive	6
Chemical	3
Waste treatment facilities	
Radioactive	2
Chemical and sewage waste	2
Solid waste storage areas	
Radioactive	3
Chemical and sewage waste	1
Miscellaneous facilities	
Chemical and sewage waste	2
Total sites	99

3.1.3 Hydrologic Description of WAG 1

WAG 1 lies within the Bethel Valley portion of the WOC drainage basin. The WAG boundary stops at the water gap in Haw Ridge, and for the purposes of the WAG description the drainage basin will be considered to end there as well. The boundaries of the basin extend to the southeast and northeast along Chestnut Ridge and Haw Ridge.

The total area encompassed by the basin in Bethel Valley is about 2,040 acres (826 ha). White Oak Creek, its headwaters and northwest tributary, as well as First and Fifth Creeks are included in the basin. Of these, WOC, First and Fifth creeks, and the proximal end of the Northwest Tributary pass through WAG 1. The Bethel Valley quadrangle (130-NE) shows a spring as the source for First Creek. The spring is located near the foot of Chestnut Ridge and has a potentially large recharge area. First and Fifth creeks collect runoff from the slopes of Chestnut Ridge and then course southeast through the plant area to their respective confluences with the Northwest Tributary and WOC. Both have similar gradients of about 4 to 5% at their headwaters and about 1 to 2% on their reaches within the main plant area (Fifth Creek is routed underground by means of concrete culverts at lower elevations in the plant area). White Oak Creek originates on Chestnut Ridge and then flows southwest along the floor of Bethel Valley through the water gap in Haw

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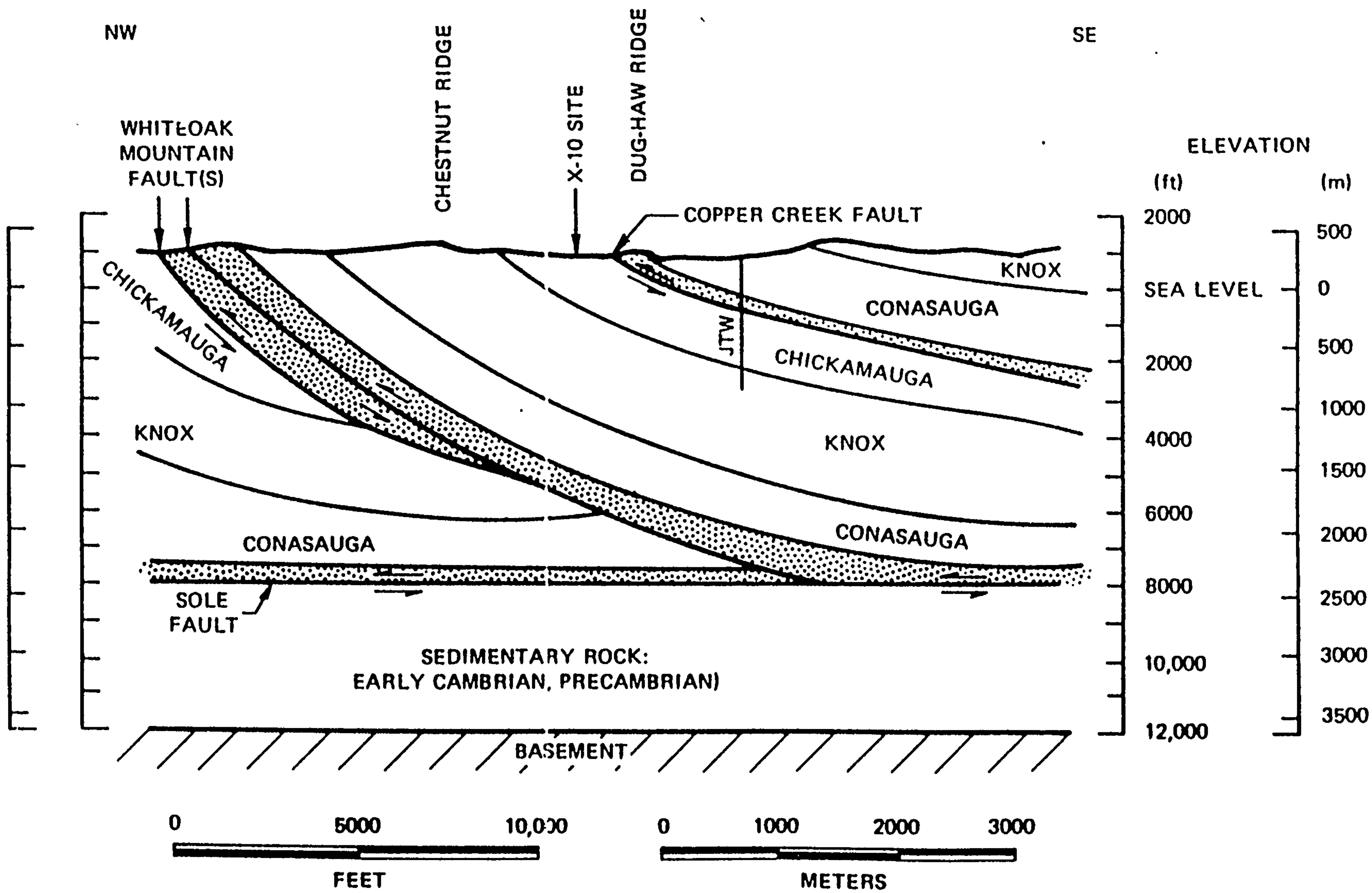

Fig. 3.2. Geologic cross-section of the ORR.

Ridge. Review of preplant construction maps indicates that minor modifications have been made to the stream beds of all three creeks. This is of note because the buried stream channels may influence the occurrence of groundwater.

The plant area has several major discharges to First, Fifth, and White Oak creeks. These include (1) treated sanitary waste from the sewage treatment plant, (2) cooling tower blowdown, (3) cooling water, (4) process wastewaters, (5) surface runoff from storm sewers, (6) treated effluent from the LLW collection and treatment system, and (7) demineralizer regenerant waste (Department of Environmental Management, 1986).

To determine the impact of ORNL discharges on receiving creeks, waste constituent concentrations and stream flow data are recorded. In WAG 1, water samples are collected from First and Fifth creeks and at WOC at the sewage treatment plant and the 7500 bridge (Fig. 3.1). The samples from First and Fifth creeks are grab samples collected weekly, composited, and analyzed monthly. The sewage treatment plant samples are flow proportional and are collected weekly, composited, and analyzed monthly. The 7500 bridge samples are flow proportional and are collected and analyzed daily for radionuclides. Flow proportional samples from this station are also collected weekly and analyzed monthly for additional parameters (Martin Marietta Energy Systems, Inc., 1986).

Previous studies (Stockdale 1951; Webster 1976) provide the most comprehensive evaluation of geology and groundwater occurrence in the ORNL area. Stockdale's report characterizes the local stratigraphy with special regard to plant waste disposal practices and groundwater. Of particular interest is the drilling program carried out by Stockdale. On the basis of the drilling and core logs, Stockdale described a secondary porosity consisting of solution cavities "an inch or so in diameter; the largest . . . about 1 foot" (Stockdale 1951). Pressure tests on an angle hole drilled beneath the 3513 pond indicated a potential connection between the solution cavities and the pond. The drill hole was tested in 5-ft (1.5-m) intervals under 100 lb of air pressure. Four zones that lost air pressure occurred in the upper 50 ft (15 m) of the hole, and air bubbles were observed on the surface of the pond. Below the 50-ft level, other intervals also lost pressure, but sufficient control of the equipment could not be maintained to determine the exact location of the interval.

Stockdale (1951) also observed that holes penetrating the Copper Creek fault exhibited a tightly cemented breccia and gouge. On this basis, he judged the fault zone to be an impervious barrier to horizontal groundwater flow. Similarly, he describes Unit F of the Chickamauga Limestone as a "stratigraphic trap" for groundwater and implies that the Rome Formation may also serve to retard horizontal groundwater flow.

Many of his findings are still relevant to current site conditions. For example, WOC and its tributaries are believed to be outflows of groundwater. The uppermost aquifer underlying WAG 1 is unconfined, and recharge to the area occurs primarily through infiltration of precipitation. Stockdale's report also included a water table map. This map depicts the groundwater surface as a subdued replica of the overlying surface topography, with minor distortions attributed to recharge from the 3500 Area ponds.

While it is common practice to plot groundwater movement on the basis of such maps, Webster (1976) describes pitfalls associated with this type of procedure in the Oak Ridge area. He cautions that the anisotropic qualities of the bedrock aquifer limit the usefulness of phreatic surface maps when applied to movement estimates at depth. He also concluded that solution cavity size and frequency of occurrence diminished with depth.

3.1.4 Known Releases from WAG 1

All drainage and treated effluents from WAG 1 ultimately discharge to WOC. As a result, there is a significant amount of information available on radionuclide and chemical waste releases from WAG 1. However, monitoring information for SWMUs within WAG 1 is essentially nonexistent. Other than the wells drilled by Stockdale in 1951, no additional monitoring wells have been installed within WAG 1 prior to 1985 (the initiation of the ORNL Remedial Action Program).

Historically, tanks in the ORNL liquid waste system have been monitored for water levels and external radiation levels; however, the contents have not been routinely sampled and analyzed. Only in the past few years have samples been taken from some of the active and inactive tanks and analyzed for radionuclide content (Peretz et al. 1986; Huang et al. 1984). Where recent information on the radionuclide inventory exists, this information has been included in the SWMU summary sheets (Part 2). Unfortunately, the high radiation levels in the samples analyzed have restricted the ability to measure hazardous constituents at the detection levels required by RCRA hazardous waste definitions.

The relatively large number of release points identified in the ORNL NPDES permit provides some indication of the magnitude of releases that are occurring from WAG 1. Measurements at these release points do not allow ORNL to identify which contaminants are being released from individual SWMUs but provide some indication of what is being released from some localities within WAG 1. Because of hydrologic interactions among individual SWMUs and the complex geology and hydrology of the main plant area, it appears that identifying the releases from individual SWMUs will be a difficult, if not impossible, task.

3.1.5 Preliminary Survey Data for WAG 1

Stream-gravel surveys were conducted in the drainages surrounding WAG 1 in the fall of 1986 (Morrison and Cerling 1987). Samples were taken at many of the stations used in the previous studies (Cerling and Spalding 1981; Cerling 1986). Samples taken from seven sites showed that most of the sites contain measurable levels of a suite of metals (including Cr, Cu, Mo, and Zn) that may have been released from cooling towers, sources along First Creek and the Northwest Tributary, or unknown sources. Several sources of Cs-137 were identified, the most significant of which is the PWTP. Strontium-90 and Co-60 were also identified in the PWTP effluent. Strontium-90 was also actively being discharged into First Creek from two pipes on the east side of the creek. Strontium-90 contamination in the Northwest Tributary appeared to result from First Creek and SWSA 3 (WAG 3). Organics (source unknown) were detected in one of the samples (Site 12); no other important contamination by organic compounds was detected.

The results obtained for radionuclides in the 1986 survey were essentially in agreement with those obtained in the 1985 survey; however, the presence of Sr-90 as an active contaminant in First Creek (initially observed in the 1985 survey) was verified. Survey data from Site 12 are given in Table 3.3. Organics data are given in Table 3.4. This site (Fig. 3.1) is considered representative of releases from WAG 1.

3.1.6 Regulatory Status of WAG 1

Based on information obtained during the preparation of the SWMU summary sheets and the limited analytical infomation that exists on groundwater contamination in WAG 1, an RI plan will be required. Although some of the SWMUs listed probably should be deleted from further consideration under Section 3004(u), the large number of contamination sources remaining will require more detailed analysis prior to conducting appropriate remedial actions [see Sect. 4.1 for a listing of SWMUs to be excluded from further Section 3004(u) evaluations]. The major contaminants of concern appear to be the radionuclides Sr-90, Cs-137, and Co-60.

Table 3.3. Preliminary survey results for WAG 1, Site 12

Year	n	Gravels (radionuclides)[a] ^{60}Co (Bq/kg)	^{90}Sr	^{137}Cs
BKGD[b]		<2	<10	3
1978	3	3,410±2,400	120±67	22,700±4,800
1985	1	1,700	100	30,000
1986	3	816±132	183±197	57,333±15,502

Year	n	Gravels (metals)[a] Cd (μg/g)	Cr	Cu	Ni	Zn
BKGD[c]		0.05	0.4	0.2	1.9	3.6
1985	1	0.42	11	8.9	2.6	150
1986	3	0.4	5.1	5.30	*d*	89±10

Year	n	Water (radionuclides) ^{60}Co (Bq/L)	^{90}Sr	^{137}Cs
BKGD[b]		<0.2	<0.2	<0.2
1985	no data available			
1986	24–25	<0.56	2.0±2.7	11.2±8.9

[a]Concentrations reported on basis of dry weight of gravel sample.
[b]Backgrounds estimated for counting procedure used in this study.
[c]Backgrounds estimated from several uncontaminated samples.
[d]Not detected.
Source: Morrison and Cerling 1987.

Table 3.4. Preliminary survey results of black muds from WAG 1, Site 12

Organic	Sample site 5472 (μg/kg)	Sample site 5473
Di-n-butylphthalate	1089	*a*
Phenanthrene	3300	*a*
Anthracene	1386	*a*
Fluoranthene	2376	264
Pyrene	1848	*a*
Benzp(a)anthracene	1716	*a*
Chrysene	1815	3036
Benzp(b)fluoranthene	165	1419
Benzo(a)pyrene	2673	*a*
Indeneo(1,2,3-cd)pyrene	2541	*a*

[a]Not detected.

3.2 WAG 2 —WHITE OAK CREEK/WHITE OAK LAKE

3.2.1 Location and Description of WAG 2

White Oak Creek/White Oak Lake (WOC/WOL) and its tributaries represent the major drainage system for ORNL and the surrounding facilities. The drainage area of WOC and its tributaries is reported to be approximately 6.4 sq mile (16.8 sq km). WOC originates from springs and surface runoff northeast of the ORNL main plant area (WAG 1), flows to the east and south of WAG 1, and exits Bethel Valley through an opening in Haw Ridge. Further downstream, a small reservoir (WOL) is formed by White Oak Dam (WOD). Discharge from WOD enters an embayment 0.6 mile (1.0 km) prior to its confluence with the Clinch River at mile 20.8 (CRK 33.5). Just upstream of WOL, Melton Branch enters WOC from the east. Melton Branch collects the drainage from many of the reactor facilities in Melton Valley. WAG 2 consists of two SWMUs: (1) SWMU 2.2, which is the area encompassed by the stream channels of White Oak Creek and Melton Branch, and (2) SWMU 2.1, which includes WOL, WOD, and the embayment. The location of WAG 2 and the two SWMUs is shown in Fig. 3.3.

In addition to natural drainage, the WOC watershed has received treated and untreated effluents from ORNL activities since 1943 and reactor cooling water taken from the Clinch River. Controlled releases include those from the PWTP (Bldg. 3544), the Sewage Treatment Plant (2521), and a variety of process waste holdup ponds scattered throughout the ORNL main plant area. White Oak Creek also receives groundwater seepage and surface drainage from nonpoint sources such as the SWSAs (WAGs 3, 4, 5, and 6), the liquid waste seepage pits and trenches area (WAG 7), and the experimental reactor facilities in Melton Valley (WAGs 8 and 9) (Fig. 3.3). Sediments within the watershed have sorbed the released chemical and radioactive contaminants and have subsequently accumulated in the floodplain and WOL bed. Under high flow conditions, these sediments can be carried through WOD and into the Clinch River.

A number of studies have been undertaken since the beginning of ORNL operations to determine contaminant sources, quantities of contaminants released to WOC and retained in WOL or discharged to the Clinch River, and to characterize the geohydrology of the watershed (Table 3.5). A summary of some of the more important studies is presented in Sherwood and Loar (1986).

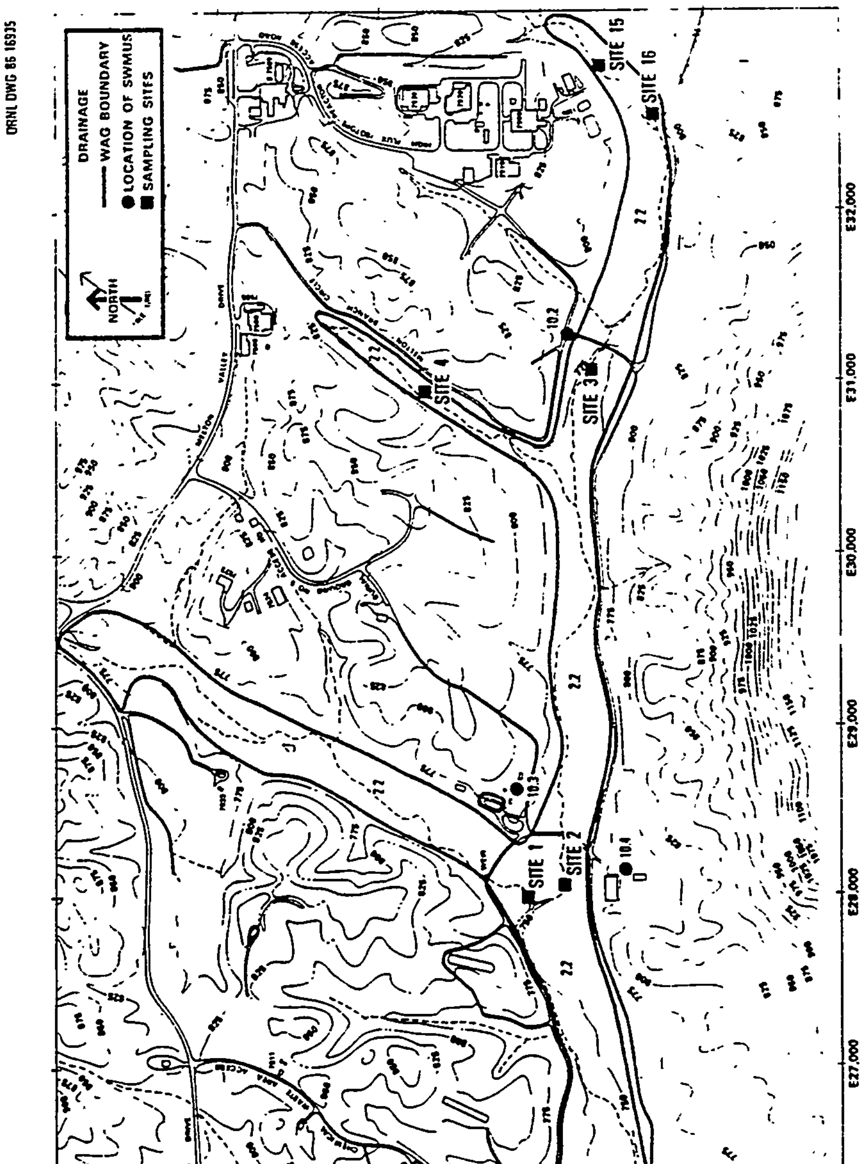

Fig. 3.3. WAG 2—White Oak Creek and White Oak Lake.

Table 3.5. Summary of significant studies conducted in WOC/WOL 1943–1986[a]

Year	References	Areas of investigation
1945–46	Cheka and Morgan (1947)	First reported data on sediments in WOL
1950	Setter and Kochtitzky (1950)	Drainage areas and estimates of WOL capacity
1948–52	Abee (1953)	Sediments in WOL
1950–53	Krumholz (1954a,b,c,)	Initial fish population and radioecological studies
1956–58	Auerbach et al. (1959)	68 shallow soil samples taken, soil mass estimated. Total ^{90}Sr content estimated. Agricultural plots established in former WOL bed
1958	Lee and Auerbach (1959)	Radiation field above the drained WOL
1961	Lomenick et al. (1961)	Sediments in WOL. Vertical and lateral distribution studied. Sediment discharge estimates in drained WOL
1962	Lomenick et al. (1962)	^{106}Ru distribution in WOL sediments. Total ^{106}Ru content estimated
1962	Lomenick et al. (1963)	Variation in radionuclide content of water and sediment with flow. 250 cores taken in lake bed. Measured thickness of sediments and radionuclide content. Cs inventory established
1964	McMaster and Richardson (1964)	Ten sediment ranges. Vertical distribution of ^{106}Ru, ^{137}Cs, and ^{60}Co measured
1965	Lomenick and Gardiner (1965)	Additional measurements of the vertical distribution of radionuclides in sediments. Vertical distribution of ^{137}Cs studied
1969	Kolehmainen and Nelson (1969)	WOL radioecology studies
1970	Tamura et al. (1970)	Sediment sampling in embayment
1972	Blaylock et al. (1972)	Update of earlier assessment of radionuclides in WOL sediments
1976	Webster (1976)	Hydrogeology of WOC/WOL
1977	Blaylock and Frank (1979)	Tritium in sediments of WOL
1978	Edgar (1978)	Flood discharge estimates
1979	Cerling and Spalding (1981)	Analysis of streambed gravels for ^{60}Co, ^{90}Sr, and ^{137}Cs
1979–80	Loar et al. (1981a)	Comprehensive study of the aquatic ecology of WOC/WOL and the CR above and below the WOC embayment
1982	Oakes et al. (1982a)	History of WOL, sediments, water quality
1983	MMES (1984)[b]	Environmental Monitoring Report. WOL sediment and water analyses
1984	MMES (1985)[b]	Environmental Monitoring Report. WOL sediment and water analyses
1985	Cerling (personal communication)	Update of 1979 streambed gravels survey
1985	Synoptic ecological survey (this report)	Update results of the 1979–80 comprehensive survey
1986	Blaylock et al. (in press)	Compilation of information on the radioecology of WOL

[a]Excluding studies of the effects of radiation and/or hazardous chemicals on aquatic populations.
[b]Martin Marietta Energy Systems, Inc.
Source: Sherwood and Loar (1986).

3.2.2 Geologic Description of WAG 2

Four major geologic units underlie the WOC drainage basin from northwest to southeast: the Knox Group of Cambrian and Ordovician age, the Chickamauga Limestone of Ordovician age, and the Rome Formation and the Conasauga Group of Cambrian age.

The Knox Group underlies much of Chestnut and Copper ridges, which bound the drainage basin to the north and south. The group is composed largely of cherty dolomite in which sinkholes and caverns have developed.

The Chickamauga Limestone underlies Bethel Valley; much of the ORNL area; and SWSAs 1, 2, and 3 near WOC. It is composed predominantly of limestone, although shales, siltstones, and bedded chert comprise a significant part of the formation. Fractures and solution openings occur between the beds of the Chickamauga Limestone, but the rock is believed to be free of large openings such as those found in the Knox Group.

The Rome Formation in the WOC basin is exposed along Haw Ridge. Locally, the bulk of the formation consists of soft, argillaceous shale (composed of clay-sized particles or minerals) containing occasional thin siltstone layers.

The Conasauga Group, commonly referred to as the Conasauga Shale, underlies Melton Valley, including SWSAs 4, 5, and 6. The general sequence through the formation is graded, from shale at its base to bedded limestone at its top. However, the lithologic character of the rock is variable, with many interbeds of shale, siltstone, and limestone. WOL and the lower part of WOC rest on limestone or shaly limestone of the Conasauga Group.

All of the formations in the drainage basin strike northeast at about 56° and dip southeast at angles commonly between 30° and 40°.

3.2.3 Hydrologic Description of WAG 2

White Oak Creek rises from springs in the Knox Formation on the southeast slopes of Chestnut Ridge north of ORNL, and with its tributary Melton Branch it drains essentially all of the ORNL facilities. Flow has been monitored in the WOD watershed since the early 1950s. Early discharge data collected by the U.S. Geological Survey (Webster 1976) at three sites in the watershed, WOD (Station 5), WOC 0.1 mile (0.16 km) above Melton Branch (Station 3), and Melton Branch 0.1 mile (0.16 km) above WOC (Station 4) are given in Table 3.6.

Table 3.6. Discharge data for three WOC watershed flow gauging stations

Station	Discharge (ft^3/s)			Period of record	
	Average	Minimum	Maximum		
White Oak Creek 0.1 mile above Melton Branch	9.62	1.9	642	10 years	1950–52 1955–63
Melton Branch 0.1 mile above White Oak Creek	2.50	No flow	242	8 years	1955–63
White Oak Dam	13.5	No flow	669	5 years	1953–55 1960–63

Source: Martin Marietta Energy Systems, Inc., 1986.

Although the normal flow is low, flood frequency curves for these stations indicate that a 100-year flood could cause a discharge of approximately 2,000 cubic feet per second (cfs) at WOD.

Water levels and flow in the WOC embayment below WOD are largely controlled by the operation of Melton Hill Dam 2.3 miles (3.7 km) upstream on the Clinch River and Watts Bar Dam, which forms Watts Bar Reservoir about 58.8 miles (94 km) downstream on the Tennessee River. When the Watts Bar Reservoir is near full pool elevation (approximately April to October), backwater from the Clinch River creates an embayment in WOC below WOD. In addition to the seasonal changes caused by Watts Bar Reservoir, daily fluctuations in water levels and flow (including flow reversals) occur because of daily releases from Melton Hill Dam (Clinch River Study Steering Committee 1967, Project Management Corporation 1975). For 1985, the average monthly flow in WOC was 2.35×10^8 gal/month (0.89×10^9 L/month), whereas the average flow in the Clinch River was 6.10×10^{10} gal/month (231×10^9 L/month). This information indicates a mean flow ratio of 260:1 for the Clinch River: WOC.

3.2.4 Known Releases from WAG 2

Oakes et al. (1982) estimated that since 1943 some 5×10^6 ft^3 (1.4×10^5 m^3) of contaminated sediment has collected in the WOL bed, containing an estimated 650 Ci (2.4×10^{13} Bq) of radioactivity, primarily Co-60, Sr-90, and Cs-137. In addition to the sediment activity, the water in the lake contains measurable quantities of H-3 and Sr-90 in solution, which are released through the monitoring station at WOD (Oakes et al. 1982). During periods of heavy rainfall, both water-borne radioactivity and contaminated sediment are released from the lake. Cesium-137 releases increase rapidly with the flow because of the increased sediment transport, while Co-60 and Sr-90 (which are primarily in solution) increase to a lesser extent (Lomenick et al. 1963; Oakes et al. 1982). For 1985, the average concentration of Sr-90 in the water flowing over WOD was 300 pCi/L; for Cs-137, 42 pCi/L; for H-3, 350 pCi/L; and for Co-60, 63 pCi/L (Martin Marietta Energy Systems, Inc., 1986).

Surveys of streambed gravels for Co-60, Sr-90, and Cs-137 by Cerling and Spalding (1981) indicate to a large degree the continuing contamination of WOC/WOL from sources within the watershed. The most important source of Co-60 contamination appears to be the High Flux Isotope Reactor (HFIR) on a tributary of Melton Branch (Fig. 3.3 and Tables 3.7 and 3.8). There are also small concentrations of Co-60 in the two tributaries adjacent to the east side of SWSA 6. In streambed sampling for Sr-90, the most important sources were found to be the main plant area (WAG 1), SWSA 4 (WAG 4), SWSA 5 (WAG 5), and the Homogeneous Reactor Experiment

Table 3.7. Preliminary survey results for WAG 2, Site 1

Year	n	Gravels (radionuclides)[a] ^{60}Co (Bq/kg)	^{90}Sr	^{137}Cs
BKGD[b]		<2	<10	3
1978	3	3,510±160	205±12	42,000±1,000
1985	4	1,395±303	240±86	27,575±17,780
1986	4	1,005±397	143±54	29,600±18,529

Year	n	Gravels (metals)[a] Cd (μg/g)	Cr	Ni	Cu	Zn
BKGD[c]		0.05	0.9	5.6	2.4	9
1985	4	0.32±0.09	15±3	4.8±1.1	21.±0.5	73±29
1986	4	0.34±0.05	14.4±10.4	16.1±16.8	4.9±0.9	58±15

Year	n	Water (radionuclides) ^{60}Co (μg/g)	^{90}Sr	^{137}Cs
BKGD[b]		<0.2	<0.2	<0.2
1985	17	0.55±0.25	4.8±1.4	3.6±3.3
1986	22–32	<0.4	3.6±1.7	5.0±3.4

[a]Concentrations reported on basis of dry weight of gravel sample.
[b]Backgrounds estimated for counting procedure used in this study.
[c]Backgrounds estimated from several uncontaminated samples.
[d]Not detected.
Source: Morrison and Cerling 1987.

Table 3.8. **Preliminary survey results for WAG 2, Site 2**

Year	n	^{60}Co	^{90}Sr	^{137}Cs
		Gravels (radionuclides)[a] (Bq/kg)		
BKGD[b]		<2	<10	3
1978	3	13,000±6,000	460±70	1,900±400
1985	3	6,500±200	1,100±800	1,150±200
1986	4	9,700±7,034	263±123	688±283

Year	n	Cd	Cr	Ni	Cu	Zn
		Gravels (metals)[a] (μg/g)				
BKGD[c]		0.05	0.9	5.6	2.4	9
1985	4	<0.14	8.7	4.1	1.0	78
1986	4	d	11.5	9.9	1.3	23

Year	n	^{60}Co	^{90}Sr	^{137}Cs
		Water (radionuclides) (μg/g)		
BKGD[b]		<0.2	<0.2	<0.2
1985	12	6.0±9.7	9.9±3.2	<0.2
1986	25	<0.01-3.3	4.4±1.9	<0.001 to 0.074

[a]Concentrations reported on basis of dry weight of gravel sample.
[b]Backgrounds estimated for counting procedure used in this study.
[c]Backgrounds estimated from several uncontaminated samples.
[d]Not detected.
Source: Morrison and Cerling 1987.

(HRE) area (WAG 9) on the Melton Branch tributary east of SWSA 5. Principal Cs-137 sources were the outfall from the PWTP (3544) in WAG 1 and the HRE area (WAG 9) on the Melton Branch tributary east of SWSA 5.

Water samples from the WOC embayment below WOD generally represent a mixture of WOC and Clinch River water because of the effects of releases in the dams on the Clinch River. However, sediments in the embayment provide a useful record of contamination. The average concentrations of Cs-137 and Co-60 in the upper fifteen 1-in. increments of 23 cores collected in the embayment during 1978–79 ranged from 11 to 51 Bq/g (3.0×10^{-10} to 1.4×10^{-9} Ci/g) and 0.3 to 2.7 Bq/g (8.1×10^{-12} to 7.3×10^{-11} Ci/g), respectively, with the highest values in the upper increments. A deeper core showed striking peaks of both Cs-137 and Co-60 at a depth of about 25 in. (64 cm), indicating much higher releases in the past.

Little information exists on the content of RCRA hazardous chemicals in either the water or sediments of WOC/WOL. Implementation of a new NPDES ambient monitoring program including stations at WOD (Station 5), WOC (Station 3), Melton Branch (Station 4), and the Sewage Treatment Plant now provides information on releases of hazardous chemicals other than radionuclides. Additional coring of the sediments in WOC/WOL is also being started to establish similar information on the WOC/WOL streambed.

3.2.5 Preliminary Survey Data from WAG 2

The studies performed in the fall of 1986 (Morrison and Cerling 1987) were a continuation of the gravel and water sampling programs conducted in past years at ORNL. The latest results mirror those reported in the previous studies—that WOC/WOL (WAG 2) contains contaminated sediments, water, and muds that are representative of all the sources in the surrounding WAGs that release contaminants to the drainage basin (Tables 3.7 and 3.8). No organics were detected in one black mud sample taken at Site 1 and in three mud samples from Site 2.

3.2.6 Regulatory Status of WAG 2

Based on the analytical studies reported by Sherwood and Loar (1986) and the scoping studies summarized in Sect. 3.2.5, there is little doubt that WAG 2 represents a source of continuing release of hazardous materials (radionuclides and/or hazardous chemicals) to the Clinch River. The fact that sediments continue to collect in the WOC streambed and in WOL indicates that as long as releases of activity (either from routine operations or contaminated seepage) continue WOC/WOL will continue to accumulate hazardous materials. Because these sediments could be resuspended and transported over WOD during periods of high flow, removal of the sediments, diversion of the flow of WOC, or sediment stabilization may be required. It is recommended that an RI plan be prepared for WAG 2; however, it should be noted that corrective actions in WAG 2 will not keep WOC/WOL from releasing hazardous materials until corrective measures have been completed for many of the upstream sources of contaminants entering the watershed. Thus, WOC/WOL could be recontaminated unless upstream sources are dealt with first.

3.3 WAG 3—SOLID WASTE DISPOSAL AREA 3

3.3.1 Location and Description of WAG 3

WAG 3 is located in Bethel Valley about 0.6 mile (1 km) west of the west entrance of the main plant area (WAG 1). WAG 3 (Solid Waste Disposal Area 3) is composed of three individual SWMUs: 3.1 (SWSA 3), 3.2 [Closed Scrap Metal Area (1562)], and 3.3, [the currently operating Contractors' Landfill (1554)]. The location of WAG 3 and its three SWMUs is shown on Fig. 3.4.

SWSA 3 and the Closed Scrap Metal Area are inactive landfills known to contain radioactive solid wastes and surplus materials generated at ORNL from 1946 to 1979. Although burial of solid waste ceased at this site in 1951, use of the area as an aboveground scrap metal storage area continued until 1979. Sometime during the period 1946–1949, radioactive solid wastes removed from SWSA 2 were buried in this site. In 1979, most of the scrap metal stored aboveground at SWSA 3 was either transferred to other storage areas, buried in SWSA 6, or buried on-site in a triangular shaped disposal area approximately 0.4 acres (0.17 ha) immediately south of SWSA 3 (Fig. 3.4). Both of these areas have been regraded, seeded, and fenced.

The Contractors' Landfill was opened in 1975 and is used to dispose of various uncontaminated construction materials and fly ash from the ORNL steam plant. No contaminated waste or asbestos is to be buried at the site. The maximum fill depth is reported to be 20 ft (6 m), and the area of the landfill is about 6 acres (2.4 ha).

3.3.2 Geologic Description of WAG 3

According to the geologic map of the Oak Ridge area prepared by McMaster (1963), WAG 3 is underlain by units E, F, G, and H of the Chickamauga Group. Units E and F underlie the northwest portion of WAG 3, unit G is under most of SWSA 3, and units G and H underlie the Scrap Metal Storage Area in the southeastern part of WAG 3.

Field measurements of the strata in and near WAG 3 (Rothschild et al. 1985), indicate that the strike of the bedrock ranges from north 65° east to north 36° east, and the dip varies from 40° southeast to 13° southwest. However, the majority of the strike and dip measurements occur in the range of N 45° to 48° east and 25° to 35° southeast, respectively. Additional geologic information is available from a set of three geophysical surveys conducted by Rothschild and Switek (1985).

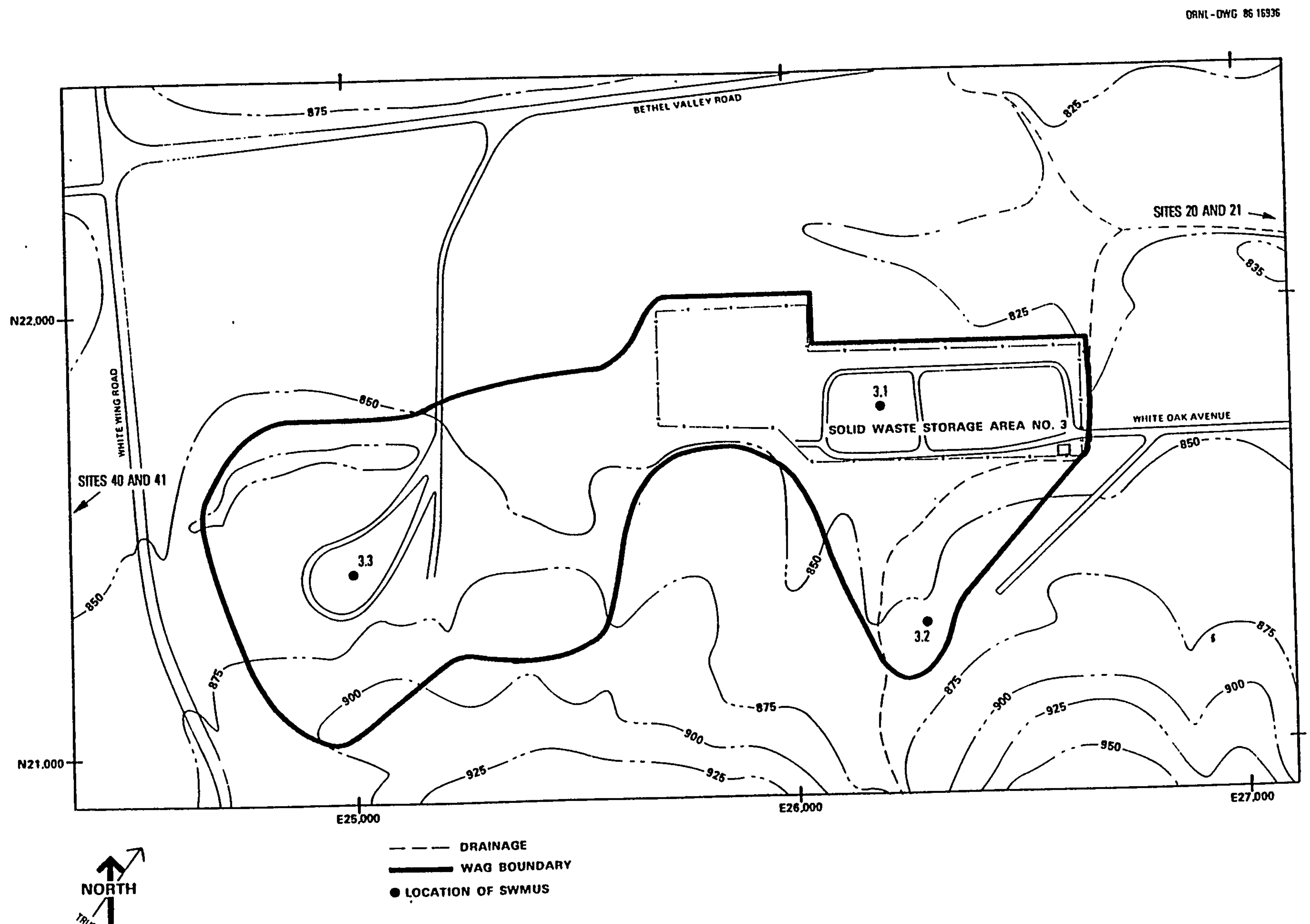

Fig. 3.4. WAG 3—Solid Waste Disposal Area 3.

Using electrical resistivity, seismic refraction, and very-low-frequency electromagnetic resistivity (VLF-EM) techniques they were able to identify the presence of an anomalous feature beneath the western portion of SWSA 3 that may be a continuous, linear element that could represent a bedrock trough or a fracture. The presence of the trough or fracture will require additional field work for confirmation.

3.3.3 Hydrologic Description of WAG 3

WAG 3 spans a surface water divide. Runoff flows northeast via the northwest tributary of WOC and southwest by way of Raccoon Creek. The northwest tributary of WOC is an ephemeral stream in the vicinity of WAG 3; however, constant flow conditions begin about 500 ft (152 m) downstream from WAG 3. Raccoon Creek starts about 600 ft (183 m) northwest of the Contractors' Landfill (SWMU 3.3) at a point where two surface runoff channels merge.

Surface drainage from the Closed Scrap Metal Area (SWMU 3.2) is toward SWSA 3 and then to the northwest tributary of WOC by means of two shallow drainage ditches along the eastern and western sides of SWSA 3.

Runoff from SWMU 3.3 enters the drainage system of the northwest tributary of WOC, and to a lesser degree, the Raccoon Creek drainage system.

A number of wells have been installed in past years (since about 1950) to measure water levels in the WAG 3 area. The USGS has reported water level measurement for these wells (Webster et al. 1981a). In the past year, a number of new piezometers have been installed to investigate groundwater flow patterns in WAG 3.

3.3.4 Known Releases from WAG 3

Records of the composition of radioactive solid waste buried in SWSA 3 are nonexistent; records for SWSA 3, 4, and part of 5 burials were destroyed in a fire in 1961 (Coobs and Gissel 1986). Sketches and drawings of the site indicate that alpha and beta-gamma wastes were segregated and buried in separate areas or trenches. Some of the alpha wastes may have been contained in drums that were placed in concrete-lined trenches; however, later in the operation, alpha-containing waste drums may have been placed in unlined trenches. Hazardous chemical wastes were probably also buried in SWSA 3 because there are no records of disposal elsewhere. Although the information is sketchy, the larger scrap metal equipment (tanks, drums, etc.) stored on the surface at this site was also probably contaminated. Because only a portion of this material is now buried in the Closed Scrap Metal Area (SWMU 3.2), it is not possible to estimate the amount of contamination that exists in this SWMU.

Because ORNL disposal procedures require that only non-RCRA, nonradioactive solid wastes are to be buried in the Contractors' Landfill, this SWMU should not represent a source of radioactivity release; however, some hazardous chemicals may have inadvertently been buried at this site prior to enactment of RCRA.

3.3.5 Preliminary Survey Data from WAG 3

The survey performed by Morrison and Cerling (1987) in the fall of 1986 included sampling sites 20 and 21 on the Northwest Tributary east of WAG 3 and 40 and 41 on the Raccoon Creek drainage west of WAG 3. Results from sites 20 and 21 are given in Tables 3.9 and 3.10. These sites do not appear in Fig. 3.4. Based on the samples taken from sites 40 and 41, Sr-90 appears to be the dominant radionuclide of concern in the Racoon Creek drainage. Average 1986 concentrations of Sr-90 were 2.9 and 6.8 Ci for sites 40 and 41, respectively. The source of the Sr-90 appears to be SWSA 3. Migration occurs along a strike to the east and west of the WAG 3 boundary. No sampling for organics (mud samples) was taken at any of the sites.

3.3.6 Regulatory Status of WAG 3

Based on available information, an RI plan will be required for WAG 3. Based on a description of the materials buried and the administrative controls exercised, SWMU 3.3 may have a negligible role in causing the releases observed from WAG 3; the survey data did not identify releases from the Contractors' Landfill. In developing the RI plan for WAG 3, major emphasis should be placed on SWMUs 3.1 and 3.2, with SWMU 3.3 being given only a cursory evaluation.

3.4 WAG 4—SOLID WASTE DISPOSAL AREA 4

3.4.1 Location and Description of WAG 4

WAG 4 consists of three SWMUs: the LLW line north of Lagoon Road (SWMU 4.1), pilot pits 1 and 2 (SWMU 4.2), and SWSA 4 (SWMU 4.3). The location of WAG 4 relative to ORNL is shown on Fig. 1.1. The boundary for WAG 4 and the topographic and drainage patterns are

Table 3.9. Preliminary survey results for WAG 3, Site 20

Year	n	Gravels (radionuclides)[a] ^{60}Co (Bq/kg)	^{90}Sr (Bq/kg)	^{137}Cs (Bq/kg)
BKGD[b]		<2	<10	3
1978	1	<5	3,100	<5
1985	1	<5	1,000	12
1986	1	<3	2,100±100	9.9±2.6

Year	n	Gravels (metals)[a] Cd (μg/g)	Cr (μg/g)	Ni (μg/g)	Cu (μg/g)	Zn (μg/g)
BKGD[b]		0.05	0.4	1.9	0.2	3.6
1986	3	<0.05−<0.3	<0.4−<2.4	3.0−<1.9	<0.2−<1.2	3–4

Year	n	Water (radionuclides) ^{60}Co (μg/g)	^{90}Sr (μg/g)	^{137}Cs (μg/g)
BKGD[b]		<0.2	<0.2	<0.2
1986	1	<0.2	100	<0.2

[a]Concentrations reported on basis of dry weight of gravel sample.
[b]Backgrounds estimated for counting procedure used in this study.
[c]Backgrounds estimated from several uncontaminated samples.
Note: No measurements reported for 1978 and 1985 for metals and waters.
Source: Morrison and Cerling 1987.

Table 3.10. Preliminary survey results for WAG 3, Site 21

Year	n	Gravels (radionuclides)[a] ^{60}Co (Bq/kg)	^{90}Sr (Bq/kg)	^{137}Cs (Bq/kg)
BKGD[b]		<2	<10	3
1978	1	<5	290	<5
1985	1	<5	80	<5
1986	1	<3	180±20	4.7±2.3

Year	n	Gravels (metals)[a] Cd (μg/g)	Cr (μg/g)	Ni (μg/g)	Cu (μg/g)	Zn (μg/g)
BKGD[c]		0.05	0.4	1.9	0.2	3.6
1986	2	<0.05−<0.3	<0.4−<2.4	0.85−<3.6	<0.2−<1.6	4–5

[a]Concentrations reported on basis of dry weight of gravel sample.
[b]Backgrounds estimated for counting procedure used in this study.
[c]Backgrounds estimated from several uncontaminated samples.
Source: Morrison and Cerling 1987.

illustrated in Fig. 3.5. Of the three SWMUs, SWSA 4 represents the most significant potential for release of radioactive and hazardous contaminants.

From 1954 to 1975, liquid radioactive wastes were transferred through an underground pipeline from the gunite storage tanks at the main ORNL complex to the waste pits and trenches (WAG 7). This transfer line was located on the north side of Lagoon Road (Fig. 3.5). The transfer line was buried in weathered Conasauga shale at a depth of about 3.3 ft (1 m). While the pipeline was in use, approximately 6.1×10^6 ft^3 (170,000 m^3) of liquid waste containing over 1.5M Ci (5.5×10^{16} Bq) of mixed fission products were transferred through the lines (Walls et al. 1983). Under the DOE Surplus Facilities Management Program (SFMP), the line was decommissioned over a two-year period beginning in 1981; decommissioning consisted of removing short sections of pipe that had the potential to leak into White Oak Creek, flushing the remaining sections of pipeline with water, purging with air to remove excess water before capping the ends, and constructing an engineered bentonite clay cover and asphalt cap over the two known leak sites south of SWSA 4 (Walls et al. 1983).

The Pilot Pit Area (Bldg. 7811) was constructed in late 1955 for use in pilot-scale radioactive waste disposal studies on the sintering (fixation) of high-level fuel reprocessing waste into a stable solid (Morgan et al. 1956a; Morgan et al. 1956b; Boegly 1957). The experimental area consists of an asphalt pad surrounded by a 6-ft (1.8-m) chain link fence adjacent to and south of SWSA 4 (Fig. 3.5). Two experiments (Pilot Pit 1 and Pilot Pit 2) were conducted during 1956 and 1957, only one of which involved radioactivity [approximately 100 mCi (3.7×10^9 Bq) of mixed fission products] (Morgan et al. 1958). The ceramic product produced in Pilot Pit 2 contained the tracer level of radioactivity and was removed from the site following its formation. The equipment from Pilot Pit 2 was removed, and the site was being converted for a high-level experiment when the sintering program was terminated by the Atomic Energy Commission (AEC, now DOE).

Currently, three large concrete cylinders imbedded vertically in the ground (containing some unused experimental equipment) are all that remains at the site (Boegly and Struxness 1959). The only visible features are a control building that is now used to store various field and laboratory equipment and four large concrete cylinders that were used in a municipal solid waste leaching experiment. Since the site was constructed, the asphalt pad has been used for temporary storage of drill rigs, drums of coal and coal waste products (gasifier ash), and other large items used in field environmental research.

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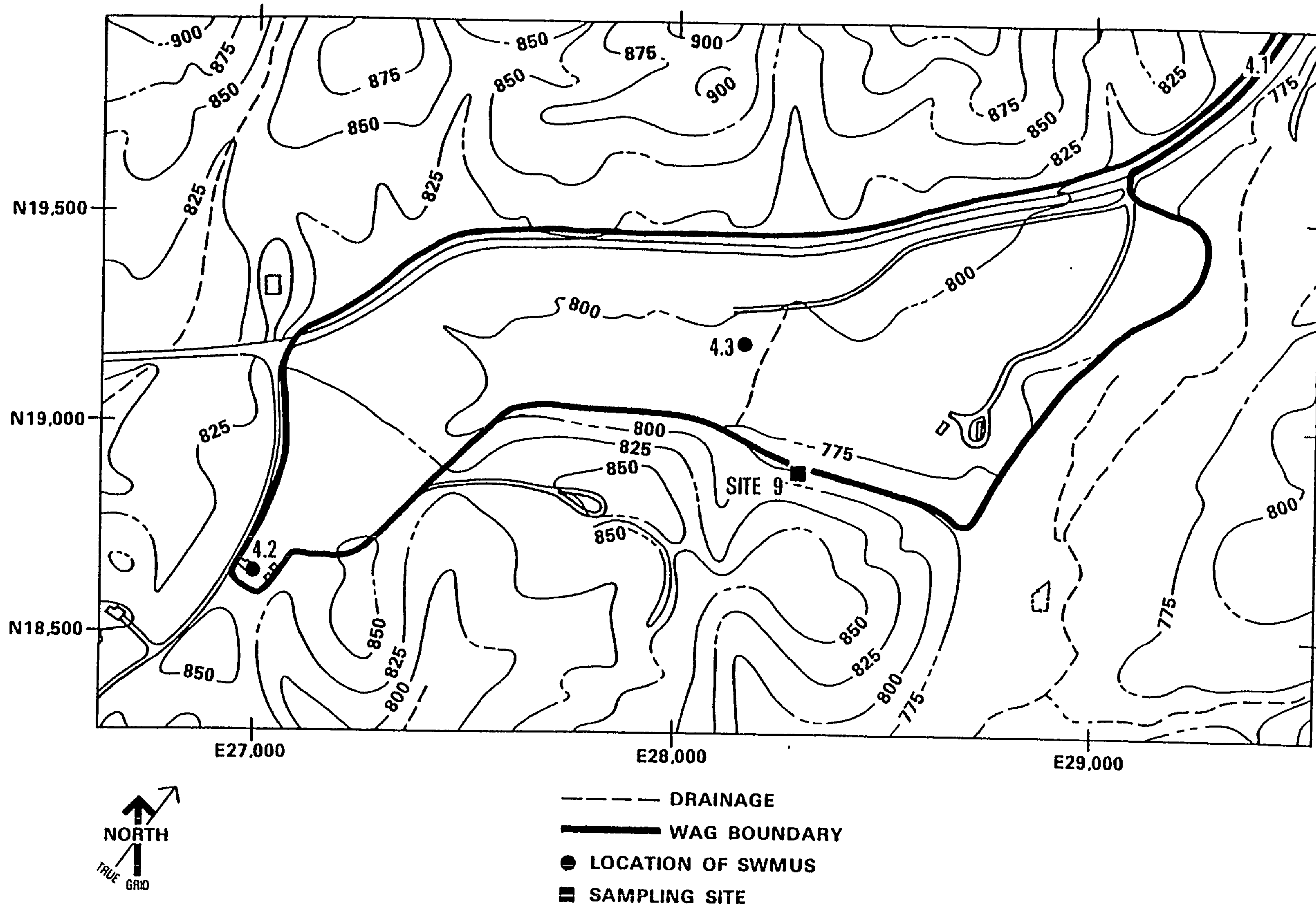


Fig. 3.5. WAG 4—Solid Waste Disposal Area 4.

The 23-acre (9.3-ha) SWSA 4 site was opened for routine solid waste burials in February 1951, following closing of SWSA 3. Unlike the three earlier SWSAs, SWSA 4 was located south of ORNL in Melton Valley, with burials occurring in the Conasauga Shale. The area of this site was approximately twice that of the previous three sites [11 acres (4.6 ha)] in use from 1943 to 1951 (National Research Council 1985). Wastes were placed in trenches, shallow auger holes, and in piles on the ground surface (to be covered at a later date). Early records of the amount of waste disposed in SWSA 4 were destroyed by a fire; however, the volume of waste buried during 1957 and 1958 was approximately 2.6×10^5 and 3.4×10^5 ft^3 (7,219 and 9,514 m^3), respectively. It is estimated by the ORNL Operations Division that the total waste volume emplaced in SWSA 4 was approximately 2.0×10^6 ft^3 (5.7×10^4 m^3), containing about 1.1×10^5 Ci (4.1×10^{15} Bq) of radioactivity. The site was closed to routine burial operations in July 1959 (Lomenick and Cowser 1961); however, it remained open as a disposal area for uncontaminated fill until July 1973.

During the period 1955 to 1963, Oak Ridge was designated by the AEC as the Southern Regional Burial Ground; as such, Oak Ridge received a wide variety of poorly characterized wastes from approximately 50 different sources. These solid wastes consisted of paper, clothing, equipment, filters, animal carcasses, and related laboratory wastes, but exact proportions of each are unknown because records of this nature were not kept. The waste from outside sources accounted for approximately 50% of the total volume buried in SWSA 4.

3.4.2 Geologic Description of WAG 4

WAG 4 is situated just northwest of a low hill (underlain by siltstone) in the lower part (Pumpkin Valley Shale) of the Conasauga Group, where a transition zone exists between the basal red shales and the overlying gray shales and interbedded lenticular limestones. The formation consists mostly of dark, maroon-to-brown, noncalcareous shales interbedded with gray, slightly calcareous shales and thin gray-blue, silty limestones. A few discontinuous, relatively pure, thin limestone lenses are present, along with an occasional fine-grained, green siltstone bed. Red and brown shales predominate in the northwest part of the area; however, in the southeast portion grey shales and interbedded limestones are most prevalent. The shales usually weather to a dull olive, yellow, or brown color, and the silty limestones weather to resistant siltstone lenses. The weathered siltstones and the shales have well developed joints and are open near the surface. Joint surfaces are frequently stained reddish brown to black. In the higher elevations of SWSA 4, weathered material extends down 13–16 ft (4–5 m), whereas in the lower elevations fresh rock is encountered within 3.3–5 ft (1–1.5 m) of the surface. A few meters of yellow-to-red clay soil was observed over some parts of the area but did not persist vertically or laterally.

Dip measurements made in and around SWSA 4 range from vertical to 27° southwest. Strike measurements varied from north 85° east to 27° east. The wide range in dip and strike indicates that many small geologic structures are present within the site (Lomenick and Cowser 1961).

3.4.3 Hydrologic Description of WAG 4

A considerable amount of hydrologic data has been collected at SWSA 4 as a result of the evaluation of two previously constructed surface water diversion projects. These data include site precipitation, flow in the SWSA 4 tributary to WOC, seasonal fluctuations in the water table, and periodic water quality monitoring at selected wells and surface streams (Davis and Shoun 1986).

Since operations began at SWSA 4 in 1951, approximately 85 wells have been drilled on the site to collect water samples and measure water table elevations. Results for the period 1975 to 1979 have been published by the USGS (Webster et al. 1981). The USGS has also conducted a number of tests in SWSA 4 wells yielding important hydraulic data pertaining to the Conasauga Formation (Webster and Bradley, in press). ORNL has been collecting water level data at 11 core hole locations and from wells at 5 points along the SWSA 4 tributary; water level data for these locations during the period June 1983 to December 1985 are presented by Davis and Shoun (1986). Water table maps prepared for SWSA 4 indicate that the general direction of groundwater flow is toward the southeast and the SWSA 4 tributary.

3.4.4 Known Releases from WAG 4

Even at the onset of waste burials in SWSA 4, it was evident that the buried waste was contacting water during most of the year. Lomenick and Cowser (1961) reported that burial was limited to higher elevations within SWSA 4 during the wet months, whereas the low topography areas were used in the dry summer months. Some of the water-related problems that were noted included a minimum depth to water between 2 and 3.3 ft (0.6 and 1.0 m) in low areas, radioactivity in site monitoring wells, and the appearance of four distinct trench seeps.

Duguid (1975) reported on the status of radionuclide movement in SWSA 4. Concentrations of Sr-90, Co-60, Cs-137, Sb-125, and H-3 were determined for a number of the existing wells and three of the four surface seeps. As a part of his study, Duguid (1975) divided SWSA 4 into eastern and western regions and reported Sr-90 concentrations on selected sampling dates. Duguid concluded that Sr-90 was the major concern in SWSA 4 and that the average concentration of Sr-90 on the east side of the site was lower than that observed on the west side. Furthermore, he estimated that between 4.4×10^{10} and 1.8×10^{11} Bq (1.2 and 4.8 Ci) of Sr-90 per year was discharged from SWSA 4 between 1963 and 1973. This was about one-third of the total annual release of Sr-90 to the Clinch River (measured at WOD).

Later studies by Stueber (1981) confirmed the earlier studies by Duguid that showed that SWSA 4 is a major contributor of Sr-90 to WOC, and that a number of contaminated surface seeps appear along the southern boundary of the site, particularly during the wet months of the year. This observation is consistent with early studies by Lomenick and Cowser (1961) that the lower elevation areas of SWSA 4 could not be used for disposal trenches during wet months.

In 1984, Spalding and Munro conducted a survey of Sr-90 in SWSA 4 groundwater by sampling 129 locations along a 2,360-ft (720-m) perimeter transect to the south and east of SWSA 4. Several peaks of Sr-90 occurred along the transect and were generally located in the vicinity of the seeps identified by Duguid (1975). Based on the results of the survey, Spalding and Munro (1984) concluded that groundwater in the eastern side of SWSA 4 contained much less Sr-90 than groundwater on the southern side and supported previous observations that future remedial actions should be directed to the southern areas of SWSA 4.

During the 28 years since routine burial ceased, two major remedial actions were taken in SWSA 4 in an attempt to isolate burial trenches from upstream groundwater recharge. The first of these projects was initiated in 1975 and consisted of constructing a bituminous concrete drainage ditch along the northern boundary of the site to catch surface runoff from Haw Ridge and direct it under Lagoon Road to three lined ditches that crossed SWSA 4 and emptied into a small tributary to the south. Unfortunately, no reduction in Sr-90 release was observed (Tamura et al. 1980). This may be the result of the lined ditches across SWSA 4 terminating in an area where earlier migration of Sr-90 had occurred or in an area where trenches already existed. In 1983, a second water diversion was built that consisted of routing the drainage from Haw Ridge around SWSA 4 rather than over it. Since completion of the new drainage project, flow measurement and stream sampling of the SWSA 4 tributary indicate that the diversion project reduces the contributing watershed area of SWSA 4 by 56%, the flow in the SWSA 4 tributary by 56%, and the Sr-90 flux by 46% (Melroy and Huff 1985, Davis et al. 1985).

3.4.5 Preliminary Survey Data for WAG 4

Site 9A was sampled by Morrison and Cerling (1987) as a part of the WAG survey in the fall of 1986 (Fig. 3.5). Migration of radionuclides and metals from SWSA 4 was evident (Table 3.11). High concentrations of Ni were detected in the stream gravels at sampling site 9A. The major hazardous material of concern is Sr-90. Two mud samples were collected at Site 9A. Only one sample showed detectable amounts of organics (di-n-butylphthalate).

3.4.6 Regulatory Status of WAG 4

Evidence from previous experimental studies and routine monitoring results [from the Department of Environmental Management (DEM)] indicates that SWSA 4 is a source of continuing

Table 3.11. Preliminary survey results for WAG 4, Site 9A

Year	n		*Gravels (radionuclides)*[a]	
		^{60}Co	^{90}Sr	^{137}Cs
			(Bq/kg)	
BKGD[b]		<2	<10	3
1978	3	253±96	28,000±2,200	5,870±1,200
1985	3	160±30	17,000±13,000	5,400±400
1986				

Year	n			*Gravels (metals)*[a]		
		Cd	Cr	Ni	Cu	Zn
				(μg/g)		
BKGD[c]		0.05	0.9	5.6	2.4	9
1986	4	0.05–0.6	0.4–1.9	99–610	0.7–4.9	3–22

Year	n		*Water (radionuclides)*	
		^{60}Co	^{90}Sr	^{137}Cs
			(Bq/L)	
BKGD[b]		<0.2	<0.2	<0.2
1985	3	<0.2	350±50	<0.2
1986	No water samples collected			

[a]Concentrations reported on basis of dry weight of gravel sample.
[b]Backgrounds estimated for counting procedure used in this study.
[c]Backgrounds estimated from several uncontaminated samples.
Note: No measurements of metals reported for 1978 and 1985. No measurements of water reported for 1978.
Source: Morrison and Cerling 1987.

release of radionuclides (primarily Sr-90) and may also be a source of hazardous chemical constituents. The survey conducted in the fall of 1986 confirmed that releases are still occurring. A recent surface water diversion project has reduced the flux of Sr-90 from SWSA 4 by about 46%; however, additional remedial actions may be required. An RI plan should be initiated for WAG 4, but it is recommended that SWMU 4.2 be removed from further consideration as a Section 3004(u) site. Remedial actions proposed for SWMU 4.3 should correct any releases, if they occur, from the other two SWMUs identified in WAG 4.

3.5 WAG 5—SOLID WASTE DISPOSAL AREA 5

3.5.1 Location and Description of WAG 5

WAG 5 is located directly south of the ORNL main plant area (Fig. 1.1). This WAG contains 22 SWMUs (Table 3.12); of these, 13 are tanks used to store LLW prior to disposal by the hydrofracture process. WAG 5 also includes the surface facilities constructed in support of both the Old and New Hydrofracture facilities. The largest land areas in WAG 5 are devoted to SWSA 5 and the Transuranium (TRU) Waste Storage Area (Fig. 3.6). The remaining SWMUs are support facilities for ORNL's hydrofracture operations, two LLW leak/spill sites, and an impoundment in SWSA 5 used to dewater sludge from the original PWTP (3518).

SWSA 5 (SWMU 5.7) was used to dispose of solid LLW generated at ORNL from 1959 to 1973. During the period 1959 to 1963, the burial ground served as the Southeastern Regional Burial Ground for the AEC (see WAG 4). At the time SWSA 5 burial operations were initiated, a portion of the site [~10 acres (4 ha)] was set aside for the retrievable storage of TRU wastes. According to AEC regulations, wastes containing over 100 nCi/g of TRU cannot be disposed of but rather must be stored in a fashion allowing them to be retrieved at a later date, if required. Although a portion of the disposal records for SWSA 5 were destroyed in a fire, there are existing records that provide some estimates of the amount of waste and radioactivity disposed of in SWSA 5. According to estimates developed by the ORNL Operations Divsion, 3.0×10^6 ft^3 (84,000 m^3) of waste containing ~200,000 Ci (7.4×10^{15} Bq) of radioactivity has been buried in SWSA 5. SWMU 5.3 (Process Waste Sludge Basin) is included within the boundary of SWSA 5. This basin was used to concentrate the Ca-Mg carbonate and clay sludge produced in the old PWTP. This sludge had previously been disposed of in the waste seepage pits at WAG 7.

Table 3.12. Solid Waste Management Units (SWMUs) in WAG 5

5.1	a,b	LLW Lines and Leak Sites
	a	= Site 30—Gauging Station, NW of Bldg. 7852
	b	= Bldg. 7852—Hydrofracture Injection Area, South
5.2		Old Hydrofracture Facility (OHF) Pond (7852A)
5.3		OHF Site Surface Facilities (7852)
5.4		New Hydrofracture Site Surface Facilities (7860)
5.5	a–e	OHF Waste Storage Tanks (T1, T2, T3, T4, T9)
	a	= T1
	b	= T2
	c	= T3
	d	= T4
	e	= T9
5.6		Process Waste Sludge Basin (7835)
5.7		SWSA-5 (7802)
5.8	a–h	LLW Waste Concentrate Storage Tanks (W-25–W-31)
	a	= W-24
	b	= W-25
	c	= W-26
	d	= W-27
	e	= W-28
	f	= W-29
	g	= W-30
	h	= W-31
5.9		Radioactively Contaminated Waste-Oil Storage Tank (7860A)
5.10		TRU Waste Storage Area

Included in the WAG 5 boundary are the surface facilities for both the old and new hydrofracture installations. It should also be noted in Fig. 3.6 that because Melton Branch (part of WAG 2) flows between the old and new hydrofracture facilities, it was necessary to provide a separate WAG boundary for the New Hydrofracture Facility (NHF), even though NHF is considered a part of WAG 5. This was done because a separate WAG was not justified for NHF, and the site's location was next to WAG 5. In general, the Old Hydrofracture Facility (OHF) and NHF surface facilities consist of buildings containing pumping equipment, control rooms, mixing equipment, and solids storage and handling equipment. Although listed as separate SWMUs, the OHF pond (SWMU 5.2) and the radioactively contaminated oil storage tank at the NHF (SWMU 5.9) are really a part of the hydrofracture surface facilities.

At the present time, LLW tanks W-24 through W-31 are being used to store evaporator concentrates pending a decision regarding ultimate disposal of these wastes. These tanks are constructed of stainless steel and have secondary containment. The five tanks of the OHF have been removed from active use.

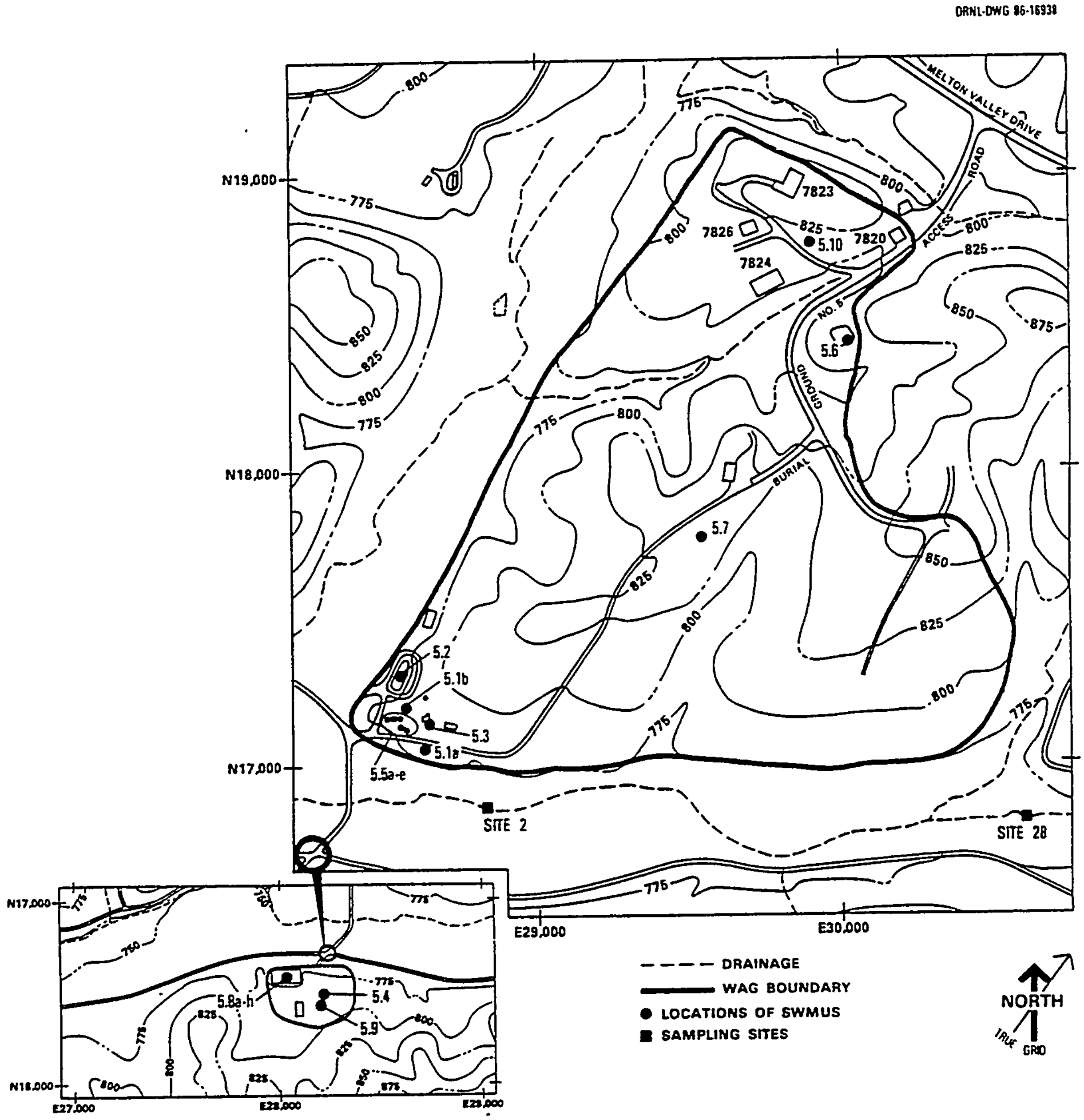


Fig. 3.6. WAG 5—Solid Waste Disposal Area 5.

Two LLW leak sites are included with WAG 5; one is related to the hydrofracture operations, and the other is an LLW line leak in the transfer line that serviced the OHF. Both of these LLW transfer lines have been removed from active use.

3.5.2 Geologic Description of WAG 5

WAG 5 is located in Melton Valley, approximately 1.2 miles (2 km) south of ORNL. Geologically, WAG 5 is within the Copper Creek thrust block and is underlain by strata of the middle to late Cambrian Conasauga Group. Regional stratigraphy and lithologic variations within the Conasauga Group are discussed in Hasson and Haase (1982). The Conasauga Group in Melton Valley is approximately 550 m (1,800 ft) thick and is lithologically very heterogeneous, consisting of alternating siltstones, silty limestones, calcareous shales, and mudstones. The Conasauga Group consists of six formations that are, in ascending order: Pumpkin Valley Shale, Rutledge Limestone, Rogersville Shale, Maryville Limestone, Nolichucky Shale, and Maynardville Limestone (Haase et al. 1985). WAG 5 is underlain primarily by the Maryville Limestone, which is typically composed of interbedded limestones, dark gray shales, and mudstones (Haase and Vaughan 1981). Structural features of the Conasauga Group are related to fault motion along the Copper Creek fault, a regionally significant, low-angle thrust fault, striking north 50°–60° east and dipping to the southeast. Typical features observed are numerous secondary low-amplitude isoclinal folds, secondary bedding plane thrust faults, high-angle reverse faults, and joint sets (Sledz and Huff 1981).

In recent years, considerable information has been compiled on the deeper geology of the WAG 5 area as a part of ORNL's studies related to the use of hydrofracturing for radionuclide disposal (Stow and Haase 1986, Haase et al. 1986). At the present time, additional geologic studies are under way to obtain more detailed information for use in planning for closure of the hydrofracturing facilities (Oak Ridge National Laboratory 1987).

3.5.3 Hydrologic Description of WAG 5

WAG 5 is located in the Melton Valley subbasin of the WOC drainage basin (Fig. 1.1). Runoff from WAG 5 directly enters WOC and Melton Branch, as well as two unnamed tributaries of these streams (Fig. 3.6). WOC flows to the south and roughly parallel to the western border of WAG 5, ranging from 100 to 300 ft (30 to 90 m) of the border; Melton Branch is within 100–300 ft of the southeastern border of WAG 5. The two unnamed tributaries flow along the northwestern boundary and southeastern corner of WAG 5. Runoff on the southern portion of SWSA 5 is collected in a system of concrete diversion ditches and discharge to (1) a draw (an ephemeral stream) that divides the southern portion of SWSA 5, (2) the unnamed tributary northeast of SWSA 5, and (3) the Melton Branch floodplain. Although a portion of the surface drainage enters Melton Branch via the draw, the majority of the surface drainage from the southern part of the site reaches WOC and Melton Branch via many small rivulets and dispersed pathways. The majority of the runoff from the northern portion of SWSA 5 reaches WOC via the draw that separates the site into its northern and southern sections. The remainder of the runoff is carried to WOC and Melton Branch by the two unnamed tributaries.

Since disposal operations were initiated in SWSA 5, a number of wells have been installed (at least 68 were reported in Webster et al. 1982). A larger number of these wells are unsatisfactory for water level and water quality determinations (they are corrugated metal casings perforated from top to bottom); however, 29 wells have plastic casings and are screened at discreet intervals that may provide reliable water level data. Recently, additional piezometer wells have been constructed in and around WAG 5 to supplement the existing water level wells. An evaluation of groundwater movement is contained in Webster and Bradley (in press) and Baughan (1987).

3.5.4 Known Releases from WAG 5

Three sources of water quality data exist for SWSA 5: (1) groundwater monitoring results from the OHF pond (Stansfield and Francis 1986), (2) the ORNL contaminant survey performed in 1985 by Doyle and Taylor (1986), and (3) studies related to the aerial distribution of Sr-90 conducted by Spalding and Munro (1984).

Four monitoring wells were installed by Francis and Stansfield (1986) at the OHF pond. Results of one year's sampling indicated that groundwater near the pond is contaminated with Sr-90 and H-3. However, in the case of H-3, the upgradient concentration was higher than that observed in downgradient concentrations, indicating that the pond may actually be diluting releases of H-3 from SWSA 5. Testing for groundwater contamination using the indicator parameters outlined in Title 40, Code of Federal Regulations (CFR) (Subpart F, Groundwater Protection, paragraph 265.92) disclosed statistically significant contamination at the OHF pond.

Contaminant surveys performed by Doyle and Taylor (1986) involved sampling of six wells and one seep in SWSA 5. Results indicated that all of the wells were contaminated with Sr-90 and

Cs-137 (H-3 was not analyzed). The survey also indicated that some of the wells may be contaminated with RCRA-regulated contaminants such as lead.

Spalding and Munro (1984) investigated the aerial distribution of Sr-90 in shallow groundwater along the southern perimeter of SWSA 5. This study indicated that there were seven distinct areas of Sr-90 contamination.

3.5.5 Preliminary Survey Data for WAG 5

Sampling sites 2 and 28 (Fig. 3.6) were included in the survey conducted by Morrison and Cerling (1987) in the fall of 1986. Results of the survey indicate that groundwater seepage from SWSA 5 is responsible for contamination of Melton Branch with Sr-90 (Table 3.13). Chromium, zinc, and nickel may also be released. Releases of other radionuclides and metals are low compared to the background levels along this stretch of Melton Branch. SWSA 5 is the main source of H-3 leakage into Melton Branch. This is shown in Table 3.14 [sites 3 and 4 are upstream of SWSA 5, and Site 2 is downstream (Fig. 3.3)]. No samples were collected for organics analyses at Site 28. No organics were detected in three mud samples taken at Site 2. WAG 5 does not appear to be, or to have been, a source of release of organics.

3.5.6 Regulatory Status of WAG 5

Evaluation of previous studies related to groundwater and surface water in the vicinity of WAG 5 indicates that this WAG represents a source of release of radionuclides and perhaps non-radioactive hazardous waste constituents to the environment. As a result, ORNL has included the preparation of an RI plan in the overall Remedial Action Program schedule (see Sect. 4.3).

The main sources of contaminant releases in WAG 5 appear to be SWSA 5 (SWMU 5.7) and the OHF pond (SWMU 5.2). The contribution of contaminants from other SWMUs in WAG 5 is probably minimal compared to the two SWMUs mentioned above. Thirteen of the 22 SWMUs in WAG 5 are active or inactive LLW storage tanks that have no past records of releases and are included in the interim permit.

Table 3.13. Preliminary survey results for WAG 5

Year	n	Site	Gravels (radionuclides)[a] ^{60}Co (Bq/kg)	^{90}Sr	^{137}Cs
BKGD[b]			<2	<10	3
1978	3	2	13,000±6,000	460±70	1,900±400
1978	3	28	43,200±10,900	141±12	1,730±1,010
1985	3	2	6,500±200	1,100±800	1,150±200
1985	3	28	24,000±2,000	210±36	1,360±780
1986	4	82	9,700±7,034	263±123	688±283
1986	1	28	27,000	14	4,700

Year	n	Site	Gravels (metals)[a] Cd (μg/g)	Cr	Ni	Cu	Zn
BKGD[c]			0.05	0.9	5.6	2.4	9
1986	3	2	*d*	11.5	9.9	1.3	2.3
1986	1	28	0.32	14	5.1	4.3	250

[a]Concentrations reported on basis of dry weight of gravel sample.
[b]Backgrounds estimated for counting procedure used in this study.
[c]Backgrounds estimated from several uncontaminated samples.
[d]Not detected.
Note: Comparison of gravels from sites 2 and 28. Site 28 is upstream and Site 2 is downstream of SWSA 5.
Source: Morrison and Cerling 1987.

Table 3.14. Tritium analyses of water from sites 2, 3, and 4 (1986)

Site	n	^{3}H (Bq/L)
2	7	29,286±14,315
3	1	1,300
4	1	36

Source: Morrison and Cerling (1987).

3.6 WAG 6—SOLID WASTE DISPOSAL AREA 6

3.6.1 Location and Description of WAG 6

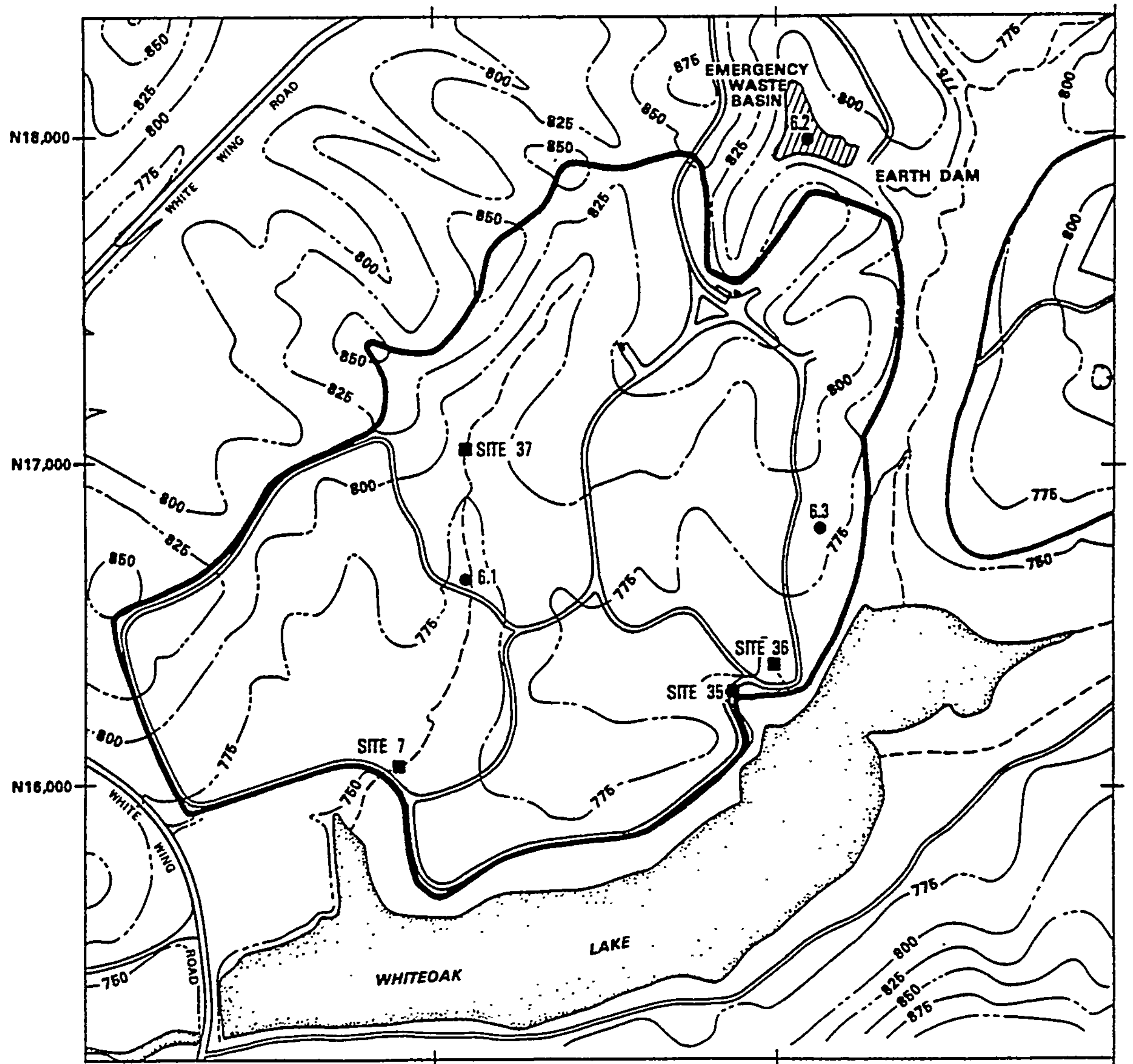
WAG 6 consists of three SWMUs: SWSA 6 (6.1), the Emergency Waste Basin (6.2), and the Explosives Detonation Trench (6.3). The location of WAG 6 relative to ORNL and the other WAGs is shown on Fig. 1.1. Figure 3.7 is a topographic map of the WAG 6 area showing the locations of the three SWMUs. Of the three SWMUs, SWSA 6 represents the most significant potential for release of radioactive and hazardous contaminants. At the present time, a portion of SWSA 6 is being closed under RCRA regulations. A characterization plan (Boegly et al. 1985), closure plan for a portion of the SWSA (IT Corporation 1986), and RI plan (ORNL/RAP-2) have been prepared for SWSA 6. This action was required when it was found that some hazardous wastes had been buried after 1980 in some of the trenches containing LLW.

The area selected for SWSA 6 is located in Melton Valley, northwest of WOL and southeast of Lagoon Road and Haw Ridge (Webster 1976). The site includes 68 acres (28 ha), of which about one-third was reported to be suitable for waste burial; the balance of the site consists of steep slopes and areas of shallow groundwater that would not be satisfactory for burial operations (Lomenick and Wyrick 1965). Waste burials were initiated in 1973 when SWSA 5 was closed. Wastes have been buried in trenches or auger holes, depending on radioactivity levels. By the end of 1984, it was estimated that about 1.0×10^6 ft^3 (28,000 m^3) of waste containing about 2.5×10^5 Ci (9.2×10^{15} Bq) of radioactivity was buried in SWSA 6 (Boegly et al. 1985). No TRU waste has been buried in SWSA 6.

The Emergency Waste Basin was constructed in 1961–1962 to provide storage if wastes could not be released from ORNL to WOC. To date, the basin has not been used. It is located northwest of SWSA 6 (see Fig. 3.7). The estimated capacity of the basin is 1.5×10^7 gal (5.7×10^7 L). There is no reported use of the basin for storage of wastes.

The Explosives Detonation Trench is located in an open area within SWSA 6. The trench is approximately 15 ft (4.6 m) long by 5 ft (1.5 m) wide by 4 ft (1.2 m) deep. Explosive and shock-sensitive chemicals requiring disposal are taken to the trench, laid in the bottom, and detonated with a small plastic explosive charge. Debris from the explosion is left in the trench. Because the hazardous materials are consumed in the explosion, there is no monitoring of the trench. A closure plan for the trench has been filed in accordance with the requirements of 40 CFR, Section 270.14(b)(13–18); Sections 264.110–115; Section 264.178; and TN 1200-1-11-.07(5)(a)(13–16).

ORNL-DWG 88-18839



------ DRAINAGE
▬▬▬ WAG BOUNDARY
● LOCATION OF SWMUS
■ SAMPLING SITES

Fig. 3.7. WAG 6—Solid Waste Disposal Area 6.

3.6.2 Geologic Description of WAG 6

WAG 6 is located in Melton Valley, approximately 1.2 miles (2 km) south of ORNL. Geologically, WAG 6 is within the Copper Creek thrust block and is underlain by strata of the middle to late Cambrian Conasauga Group. Regional stratigraphy and lithologic variations within the Conasauga Group are discussed in Hasson and Haase (1982). The Conasauga Group in Melton Valley is approximately 1,800 ft (550 m) thick and is lithologically very heterogeneous, consisting of alternating siltstones, silty limestones, calcareous shales, and mudstones. The Conasauga Group consists of six formations, which are in ascending order: Pumpkin Valley Shale, Rutledge Limestone, Rogersville Shale, Maryville Limestone, Nolichucky Shale, and Maynardville Limestone (Haase 1986). WAG 6 is underlain primarily by the Maryville Limestone, which is typically composed of interbedded limestones, dark gray shales, and mudstones (Haase and Vaughan 1981). Structural features of the Conasauga Group are related to fault motion along the Copper Creek fault, a regionally significant, low-angle thrust fault, striking north 50°–60° east and dipping to the southeast. Typical features are numerous secondary, low-amplitude isoclinal folds; secondary bedding plane thrust faults; high-angle reverse faults; and joint sets (Sledz and Huff 1981).

In recent years, considerable information has been compiled on the geology of the WAG 6 area (Boegly et al. 1986). Most of this information was obtained as a part of earlier remedial action and site characterization studies (Davis et al. 1984; Vaughan et al, 1982; and Davis and Stansfield 1984). At the present time, additional geologic studies are under way in SWSA 6 to obtain information for use in closure planning.

3.6.3 Hydrologic Description of WAG 6

All surface runoff from WAG 6 eventually enters WOL. There are no permanent streams within the WAG 6 boundary; however, there are some ravines or draws that collect excess rainfall and transmit it to the lake. Cerling and Spalding (1981) identified subdrainages within WAG 6 as a part of their study of contaminant sources in the WOC watershed. Most of the flow from these subdrainages enters WOC directly. A portion of the eastern part of WAG 6 drains to stream BG6E, which is located just east of the WAG boundary. Stream BG6E also receives flow from the Pits and Trenches Area (WAG 7), and the relative contribution of SWSA 6 to the contaminants measured in BG6E cannot be isolated.

Previous studies have shown that the water table elevation in SWSA 6 is a subtle replica of the topographic surface (Lomenick and Wyrick 1965; Boegly et al. 1985). Unfortunately, most of the existing wells in SWSA 6 (installed prior to 1985) are not useful for hydrostatic head measurement or groundwater quality analyses (i.e., corrugated metal casings, open hole completion, or slotted casing from near surface to full depth). Since the start of the characterization plan, a number of piezometer wells have been installed to obtain information on groundwater movement and aid in the location of additional groundwater monitoring wells.

3.6.4 Known Releases from WAG 6

Streambed gravel studies conducted by Cerling and Spalding (1982) in the WOC drainage basin showed that an intermittent stream channel passing through the center of SWSA 6 contained concentrations of Sr-90 in excess of background. Follow-up studies conducted in 1986 indicate that the amount of Sr-90 in this stream channel appears to be decreasing but has not stopped. As noted earlier, it has not been possible to determine what contribution SWSA 6 may make to stream BG6E. New sources of Cs-137 and Co-60 were detected in the eastern portion of WAG 6 (sites 35 and 36) between 1978 and 1985. Sampling of the small drainage from the Emergency Waste Basin did not show the presence of radionuclide contamination.

3.6.5 Preliminary Survey Data for WAG 6

In the fall of 1986, a limited sampling of stream gravels, muds, and surface water was undertaken in WAG 6 to determine the need to conduct further remedial action investigations on the SWMUs in WAG 6. Samples were taken at sites 7, 35, 36, and 37 (Fig. 3.7). Strontium-90 contamination was present at Site 7, as it was in earlier surveys; however, the concentrations have diminished from 1978 to 1986, even though a new source of Sr-90 contamination has been detected at site 37 (upstream from Site 7, see Fig. 3.7) since samples were first taken in 1978 (Table 3.16). The 1986 samples from sites 35 and 36 indicate that the sites are still contaminated with Co-60 and Cs-137 (see Tables 3.15 and 3.16). Except for a single sample containing significant concentrations of Cu, Zn, and Mo, the concentrations of metals were low (Table 3.17). Three mud samples were taken at Site 7; however, no organics were detected in any of the samples.

Table 3.15. Preliminary survey results for WAG 6, Site 35

Year	n	Gravels (radionuclides)[a] ^{60}Co (Bq/kg)[a]	^{90}Sr	^{137}Cs
BKGD[b]		<2	<10	3
1978	1	<5	23	<5
1985	1	100	29	760
1986	1	6.8	8.6	32

Year	n	Gravels (metals)[a] Cd (μg/g)	Cr	Ni	Cu	Zn
BKGD[c]		0.05	0.9	5.6	2.4	
1985	1	<0.05	1.3	2.5	0.28	17
1986	1	<0.3	<2.4	<3.6	<1.2	2.3

[a]Concentrations reported on basis of dry weight of gravel sample.
[b]Backgrounds estimated for counting procedure used in this study.
[c]Backgrounds estimated from several uncontaminated samples.
Source: Morrison and Cerling 1987.

Table 3.16. Preliminary survey results for WAG 6, Site 36

Year	n	Gravels (radionuclides)[a] ^{60}Co (Bq/kg)[a]	^{90}Sr	^{137}Cs
BKGD[b]		<2	<10	3
1978	1	<5	50	38
1985	1	97	11.	390
1986	1	3	12	52

Year	n	Gravels (metals)[a] Cd (μg/g)	Cr	Ni	Cu	Zn
BKGD[c]		0.05	0.9	5.6	2.4	
1985	1	<0.05	<0.4	2.7	5.1	28
1986	1	<0.3	<2.4	<3.6	<1.2	4.3

[a]Concentrations reported on basis of dry weight of gravel sample.
[b]Backgrounds estimated for counting procedure used in this study.
[c]Backgrounds estimated from several uncontaminated samples.
Source: Morrison and Cerling 1987.

Table 3.17. Preliminary survey results for WAG 6, Site 7

Year	n	^{60}Co	^{90}Sr	^{137}Cs
		Gravels (radionuclides)[a] (Bq/kg)		
BKGD[b]		<2	<10	3
1978	3	<5	2,700±450	22±16
1985	3	<6	823±121	18±1
1986	1	<6	980	13

Year	n	Cd	Cr	Ni	Cu	Zn
		Gravels (metals)[a] (μg/g)				
BKGD[c]		0.05	0.9	5.6	2.4	9
1986	5	nd[d]–<0.098	nd–<1.3	nd–<6.7	nd–<0.92	nd–4.1

Year	n	^{60}Co	^{90}Sr	^{137}Cs
		Water (radionuclides) (Bq/L)		
BKGD[b]		<0.2	<0.2	<0.2
1985	2	<0.2	3.9±1.3	<0.2
1986	No water flowing at time of sampling.			

[a]Concentrations reported on basis of dry weight of gravel sample.
[b]Backgrounds estimated for counting procedure used in this study.
[c]Backgrounds estimated from several uncontaminated samples.
[d]Not detected.
Note: No measurements reported for metals in 1978 and 1985. No data for water for 1978.
Source: Morrison and Cerling 1987.

3.6.6 Regulatory Status of WAG 6

An RI plan for SWSA 6 has been drafted (December 1986). However, it appears from the data available that two of the SWMUs (the Emergency Waste Basin and the Explosives Detonation Trench) should not require further attention. The Explosives Detonation Trench is an interim status facility and there are no reports to indicate that radioactive wastes have ever been directed to the Emergency Waste Basin. The focus of the RI plan is SWSA 6 (SWMU 6.1).

3.7 WAG 7—LLW PITS AND TRENCHES AREA

3.7.1 Location and Description of WAG 7

WAG 7 is located in Melton Valley about 1 mile (1.6 km) south of the ORNL main plant area (Fig. 1.1). A listing of the SWMUs in WAG 7 is given in Table 3.18. In terms of radioactivity, the major SWMUs in WAG 7 are the seven pits and trenches used from 1951 to 1966 for the disposal of LLW. During the operating history of the pits and trenches, a total of 42M gal (159M L) of LLW, containing about 1.2M Ci (4.4×10^{16} Bq) (beta) of radioactivity was discharged to these disposal facilities. Correcting for radioactive decay, it is estimated that about 200,000 Ci (7.4×10^{15} Bq) of Sr-90, 600,000 Ci (2.2×10^{16} Bq) of Cs-137, and a much smaller amount of U and TRU isotopes remain.

WAG 7 also includes a decontamination facility, three leak sites, a storage area containing shielded transfer tanks and other equipment, and seven fuel wells containing the acid solutions containing enriched uranium (primarily) from HRE fuel. Additional details on WAG 7 can be found in ORNL/RAP-10, *Environmental Data Package for the ORNL Seepage Pits and Trenches Waste Area Grouping.*

3.7.2 Geologic Description of WAG 7

WAG 7 rests on weathered materials from the Conasauga Group, light-brown layered and banded weak rock broken into small prisms (deLaguna et al. 1958). Weathering extends to a depth of 30–40 ft (9–12 m) under the low ridges and to a depth of about 10 ft (3 m) under the valleys; in

Table 3.18. SWMUs in WAG 7

7.1	Decontamination Facility (7819)
7.2	Homogeneous Reactor Experiment (HRE) Fuel Wells (7809)
7.3	Hydrofracture Experimental Site 1, Soil Contamination (HF-SIA)
7.4 a–c	LLW Lines and Leak Sites
	a = Hydrofracture No. 1, Release of Grout
	b = Pit 6, Southeast
	c = End of Trench 7 Access Road
7.5	Pit 1 (7805)
7.6	Pits 2, 3, and 4 (7806, 7807, 7808)
7.7	Trench 5 (7809)
7.8	Trench 6 (7810)
7.9	Trench 7 (7818)
7.10	Shielded Transfer Tanks (ST1, ST2, ST3, ST4, ST5)

many places, the bottom of the weathered zone is roughly at the water table. The fresh shale below is composed of thin alternating layers of hard dark-gray calcareous shale and light-gray shaly limestone. Much of the carbonate is leached out by the weathering; usually, the limestone layers are turned into silty clay and the shale layers into a fine silty sand.

In general, the shale dips to the southeast at about 35°, but there are several types of structures that complicate this simple pattern. During excavation of Pit 3, a reversal of dip was observed that produced a small anticline and syncline (the width of the structure being about 150 ft [46 m]). The dips are gentle, and there is no evidence of crumpling or faulting. In the area occupied by Pit 4, the beds are intensely and irregularly folded and crumpled. Exposures suggest that this belt of crumpled beds is roughly 200 ft (61 m) wide and that it extends east and west along the strike for at least 1,000 ft (305 m). Some hydrological evidence exists to suggest that this belt of crumpled rock is bordered on the south by a fault, possibly a thrust fault related to the Copper Creek fault. South of Pit 4 and south of the presumed fault, there are a number of small folds. Exposures in and near Pit 2 are poor, but it appears possible that no folds or faults exist in that area.

3.7.3 Hydrologic Description of WAG 7

Surface drainage from WAG 7 occurs primarily in three channels that trend north-south through the area. Additional intermittent runoff occurs in small swales that drain seeps or minor subbasins. All surface flow drains into WOC. Routine monitoring of flow occurs at the East Weir and West Weir stations (Sites 5 and 6 in Fig. 3.8). The West Weir (Site 6) receives flow from Haw Ridge and the western border of the WAG. This includes runoff diverted from the area north of WAG 4 and runoff from Pit 1 and WAG 6. Runoff from the area that includes pits 2, 3, and 4 is divided between the West Weir and the East Weir, which also collect flow from a portion of the Trench 5 area. The unnamed and unmonitored tributary between trenches 5 and 7 also receives runoff from the Trench 6 vicinity. Surface runoff from Trench 7 has been diverted to the west into this tributary.

Groundwater flow can be inferred from knowledge of topography and results of tracing tests that show a strong anisotropy that favors flow along geologic strike, which trends east-west (Spalding and Boegly 1985). Because the water-table elevation resembles topographic features, groundwater seepage will generally move from areas of topographic highs to adjacent streams and swales. Lomenick et al. (1964) observed groundwater velocities of 0.5 ft/d at the Pit 4 site. A typical

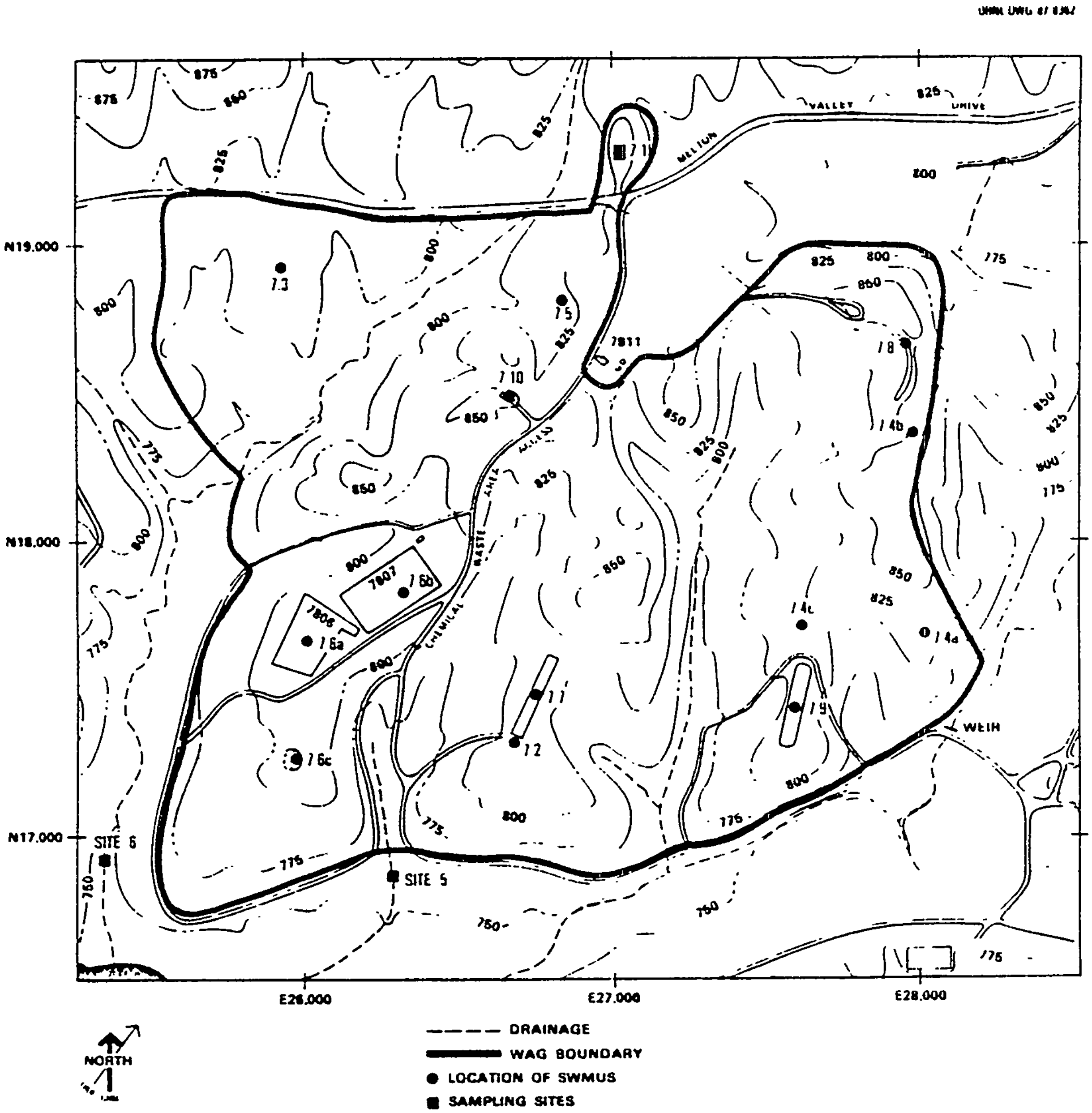


Fig. 3.8. WAG 7—LLW Pits and Trenches Area.

hydraulic conductivity for this area is 2×10^{-5} cm/s, although considerable variability is expected (Boegly 1984). Radioactivity logs of borings in the vicinity of Pit 4 (Spalding and Boegly 1985) and Trench 7 (Olsen et al. 1983) suggest that groundwater flow follows preferential pathways, often along narrow bedding planes. Thus, groundwater flow at a given SWMU can be expected to be predominantly along geologic strike (east-west) and in the downslope direction.

3.7.4 Known Releases from WAG 7

Spalding (1987) prepared an environmental data package for WAG 7 that summarizes past information on releases. In the past some surface seepage has been observed from all seven pits and trenches (except Trench 5) used for past waste disposal operations. It is thought that some of these seeps or discharges resulted from poor site selection (pits 1 and 6), whereas others appeared to release radionuclides that were not sorbed by the pit walls and surrounding soils. Ruthenium-106 appears to have been the major radionuclide of concern during operation of the pits and trenches; however, Sr-90 and Co-60 are the predominant releases since the pits have been taken out of service (Cerling and Spalding 1981). Studies conducted in recent years in the vicinity of Trench 7 (Olsen et al. 1983) have shown the presence of H-3, U-233, and Tc-99.

In a streambed contaminant survey conducted in 1985 by Cerling and Huff (1986), sites 5 and 6 were examined to evaluate releases from WAG 7. They found evidence of minor active movement of Sr-90 and Co-60, which they reported might be more related to redistribution of contaminants within the streambed and sediments than to active inputs. They also reported that contaminant levels had declined by a factor of 3 to 4 in the vicinity of the pits and trenches, which they suggested might be the result of the installation of asphalt caps over the pits in 1980.

3.7.5 Preliminary Survey Data for WAG 7

Two sampling sites (5 and 6, Fig. 3.8) were used for sampling stream gravels, muds, and water to evaluate releases from WAG 7. The preliminary survey conducted by Morrison and Cerling (1987) indicates that the drainage from WAG 7 is being actively contaminated by radionuclides, mainly Sr-90 and Co-60 (Tables 3.19 and 3.20), although the releases appear to be declining from observations made in earlier surveys (Cerling and Spalding 1981, Cerling 1986). The decline was thought to be because of remedial actions conducted in WAG 7. Concentrations of metals in the stream gravels were found to be significantly elevated above background only at Site 5 (Tables 3.19

Table 3.19. Preliminary survey results for WAG 7, Site 5

Year	n	Gravels (radionuclides)[a] ^{60}Co	^{90}Sr	^{137}Cs
		(Bq/kg)		
BKGD[b]		<2	<10	3
1978	3	45,000 ± 19,000	45 ± 8	990 ± 440
1985	3	13,000 ± 2,000	19 ± 62	60 ± 100
1986	1	12,000	35	240

Year	n	Gravels (metals)[a] Cd	Cr	Ni	Cu	Zn
		(μg/g)				
BKGD[c]		0.05	0.9	5.6	2.4	9
1986	4	nd[d]–<0.3	2.2–9	nd–6.9	<1.0–3.2	nd–28

Year	n	Water (radionuclides) ^{60}Co	^{90}Sr	^{137}Cs
		(Bq/L)		
BKGD[b]		<0.2	<0.2	<0.2
1986	2	28–30	0.24–0.36	<0.2–<0.3

[a]Concentrations reported on basis of dry weight of gravel sample.
[b]Backgrounds estimated for counting procedure used in this study.
[c]Backgrounds estimated from several uncontaminated samples.
[d]Not detected.

Note: No measurements of metals were made for 1978 and 1985. No measurements of water reported for 1978 and 1985.

Source: Morrison and Cerling 1987.

and 3.20). No organic compounds were detected. Two black mud samples were collected at Sites 5 and 6. No organics were detected in any of the samples.

3.7.6 Regulatory Status of WAG 7

WAG 7 requires the development of an RI plan. This WAG has shown past and continuing releases of radioactivity and may also be a source of hazardous contaminants.

Table 3.20. Preliminary survey results for WAG 7, Site 6

Year	n	Gravels (radionuclides)[a] ^{60}Co (Bq/kg)	^{90}Sr (Bq/kg)	^{137}Cs (Bq/kg)
BKGD[b]		<2	<10	3
1978	3	13,100 ± 1,500	600 ± 55	135 ± 115
1985	3	2,600 ± 100	240 ± 30	115 ± 40
1986	1	5,700	590	380

Year	n	Gravels (metals)[a] Cd (μg/g)	Cr (μg/g)	Ni (μg/g)	Cu (μg/g)	Zn (μg/g)
BKGD[c]		0.05	0.9	5.6	2.4	9
1986	4	nd[d]–<0.05	nd–2.2	nd–6.2	1.0–1.6	2–6

Year	n	Water (radionuclides) ^{60}Co (Bq/L)	^{90}Sr (Bq/L)	^{137}Cs (Bq/L)
BKGD[b]		<0.2	<0.2	<0.2
1986	2	1.9–12	2.8	<0.2–0.15

[a]Concentrations reported on basis of dry weight of gravel sample.
[b]Backgrounds estimated for counting procedure used in this study.
[c]Backgrounds estimated from several uncontaminated samples.
[d]Not detected.
Note: No measurements of metals were made for 1978 and 1985. No measurements of water reported for 1978 and 1985.
Source: Morrison and Cerling 1987.

3.8 WAG 8—MELTON VALLEY AREA

3.8.1 Location and Description of WAG 8

Most of the reactor facilities other than those located in the ORNL main plant area (WAG 1) are located in Melton Valley. This WAG includes the Molten Salt Reactor Experiment (MSRE) and the High Flux Isotope Reactor (HFIR). Wastes from these facilities are collected on-site in LLW tanks and then pumped to WAG 1 for storage and treatment. Wastes from WAG 9 (Homogeneous Reactor Experiment Area) also are pumped from their storage tanks to WAG 1 using the same transfer system. The waste transfer pipeline originally used followed Melton Valley Drive to its intersection with the waste line to the waste pit area (WAG 7). However, because of leaks the pipeline along Melton Valley Drive was replaced with a new double-contained stainless steel line that was routed directly to WAG 1.

The location of WAG 8 and its SWMUs is shown in Fig. 3.9. In addition to the waste transfer line and its collection tanks, WAG 8 also includes a number of holding ponds, waste storage facilities, and one of the experimental hydrofracture sites. Table 3.21 lists the 20 SWMUs that are located in WAG 8.

3.8.2 Geologic Description of WAG 8

The WAG is situated on three major geologic units. The southern part of the WAG lies upon the Conasauga Group, which has Pumpkin Valley Shale, Rutledge Limestone, Rogersville Shale, Maryville Limestone, Nolichucky Shale, and Maynardville Limestone as members. The LLW transfer line along Melton Valley Drive overlies the Pumpkin Valley Shale. The portion of the transfer line that passes over Haw Ridge and into the southern part of the main ORNL plant complex crosses the Rome Formation and terminates in the upper units of the Chickamauga Limestone.

3.8.3 Hydrologic Description of WAG 8

Surface water runoff from WAG 8 flows predominantly southward into Melton Branch and then downstream where it joins with flow from WOC. Flows in Melton Branch are affected by operations at the HFIR complex. This is most apparent during late summer when natural flows cease and operations discharges comprise all the flow.

Groundwater movement from the main portion of the WAG is inferred to follow the same general pathways as surface water drainage. There There is evidence in a similar geologic setting (SWSA 6) for recharge areas in the higher elevations at the northern part of the site and groundwater discharge toward the surface in the southern area along Melton Branch. There are several water quality monitoring wells and piezometers installed in the vicinity of the HFIR ponds. Data from these wells are being analyzed to develop a more refined description of the local groundwater flow system. For the LLW transfer line portion of the WAG, it is presumed that the permanent water table is below the trench and fill material associated with the line.

3.8.4 Known Releases from WAG 8

The initial stream gravel studies of Cerling and Spalding (1981) identified WAG 8 as a major source of Co-60 contamination, with measurable releases of Cs-137 also being detected. In general,

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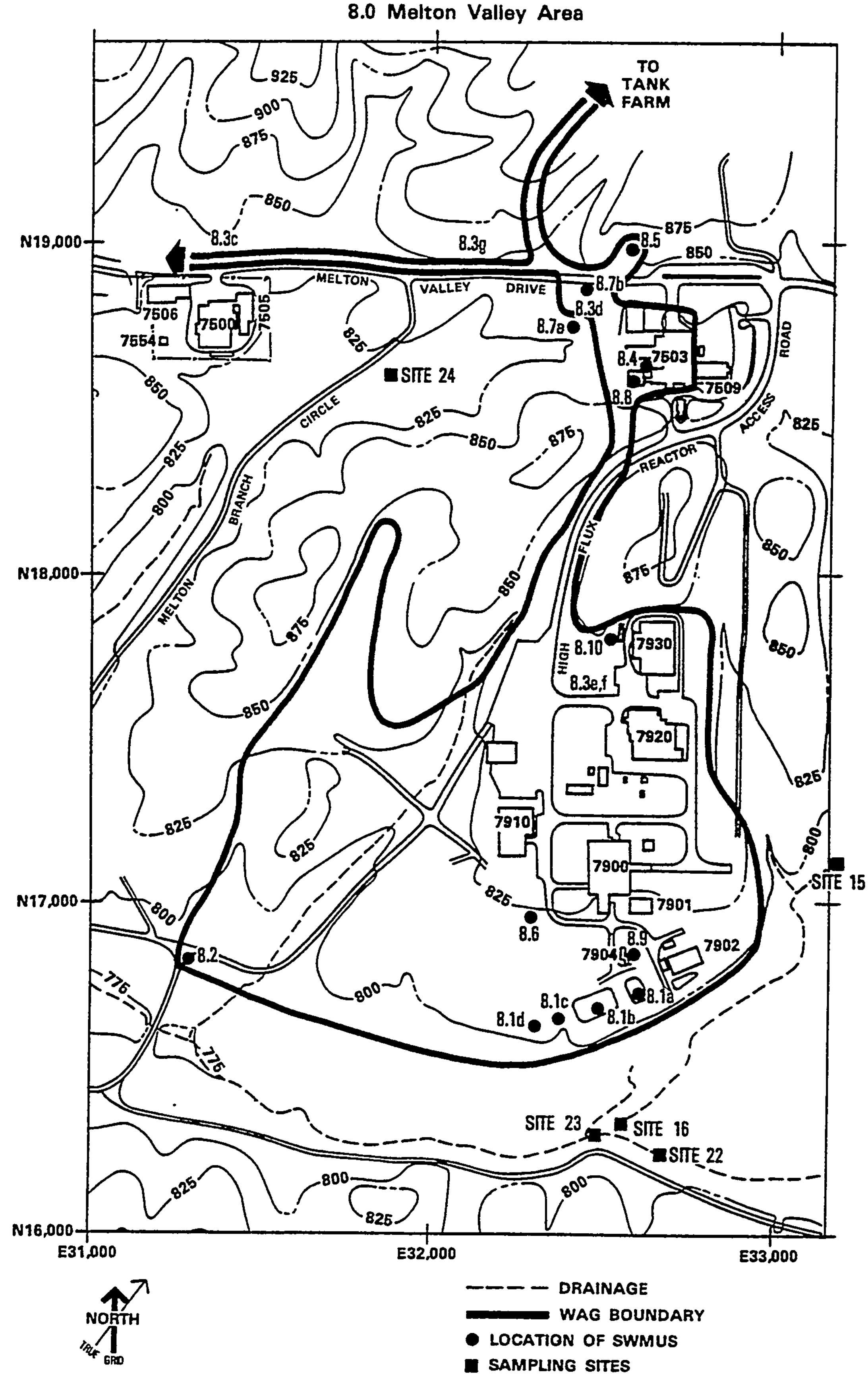

Fig. 3.9. WAG 8—Melton Valley Area.

Table 3.21. **SWMUs included in WAG 8**

8.1a–d	HFIR/TRU Waste Collection Basins (7905, 7906, 7907, 7908)
8.2	Hydrofracture Experimental Site 2, Soil Contamination (HF-S2A)
8.3a–g	LLW Line and Leak Sites—Melton Valley Drive Area (7 leak sites)
	a = Melton Valley Drive
	b = Melton Valley Drive and SWSA 5 Access Road
	c = 7500 Area
	d = West of Melton Valley Pumping Station
	e = Bldg. 7920 and Melton Valley Pumping Station Area
	f = Bldg. 7920 Ditch Line
	g = Melton Valley Transfer Line
8.4	Hazardous Waste Storage Facility (7507)
8.5	Active LLW Collection and Storage Tank (WC-20)
8.6	Active LLW Collection/Storage Tank (HFIR)
8.7a–b	Active LLW Collection/Storage Tank (T-1, T-2)
8.8	Mixed Waste Storage Pad (7507W)
8.9	Sewage Treatment Plant (7904)
8.10	Silver Recovery Plant (7834)

the source of this contamination appeared to be the cooling water effluent from the HFIR. Strontium-90 was not detected above background concentrations. In the 1985 survey, essentially the same findings for radionuclides were reported; in addition, there was clear evidence that WAG 8 was also a potential source of Zn and Cr releases (Cerling and Huff 1986).

3.8.5 Preliminary Survey Data for WAG 8

Four sampling sites were used by Morrison and Cerling (1987) in evaluating WAG 8. Two of the sites (15 and 22) are located above most of the HFIR discharges and are used as indicators of background contamination prior to WAG 8 (Fig. 3.9). No contamination by radionuclides or metals was detected at either site. Site 16 is below the cooling effluents from HFIR. The site is mainly contaminated by Co-60, with lesser amounts of Cs-137 and Sr-90 (Table 3.22). The Cs-137 and Sr-90 concentrations observed were reported to have declined from those observed in previous surveys (Cerling and Spalding 1981). Based on the results of this survey, Morrison and Cerling (1987) concluded that the cooling water effluent from HFIR was the dominant discharge source of Co-60 from ORNL facilities. Sampling at Site 23 also indicated that Co-60 and Cs-137 were present in the stream gravels of Melton Branch, but Sr-90 was at background level (Table 3.23). Sampling site 24 (Table 3.24, WAG 9) indicates that Sr-90 and Cs-137 are being released from the MSRE area. The source of these contaminants cannot be identified at this time.

Table 3.22. Preliminary survey results for WAG 8, Site 16

Year	n	Gravels (radionuclides)[a] ^{60}Co (Bq/kg)	^{90}Sr (Bq/kg)	^{137}Cs (Bq/kg)
BKGD[b]		<2	<10	3
1978	3	29,200 ± 13,300	48 ± 15	232 ± 70
1985	1	41,000	360	130
1986	1	56,000 ± 3,000	5.6 ± 3.3	150 ± 40

Year	n	Gravels (metals)[a] Cd (μg/g)	Cr (μg/g)	Ni (μg/g)	Cu (μg/g)	Zn (μg/g)
BKGD[c]		0.05	0.9	5.6	2.4	9
1986	2	<0.1–0.4	9.8–11	7.3–7.9	15	340–400

[a]Concentrations reported on basis of dry weight of gravel sample.
[b]Backgrounds estimated for counting procedure used in this study.
[c]Backgrounds estimated from several uncontaminated samples.
Note: No measurements of metals were made for 1978 and 1985.
Source: Morrison and Cerling 1987.

Table 3.23. Preliminary survey results for WAG 8, Site 23

Year	n	Gravels (radionuclides)[a] ^{60}Co (Bq/kg)	^{90}Sr (Bq/kg)	^{137}Cs (Bq/kg)
BKGD[b]		<2	<10	3
1978	3	25,500 ± 12,000	<10	360 ± 170
1985	3	25,300 ± 5,100	<10	140 ± 100
1986	1	21,000	4.7	75

Year	n	Gravels (metals)[a] Cd (μg/g)	Cr (μg/g)	Ni (μg/g)	Cu (μg/g)	Zn (μg/g)
BKGD[c]		0.05	0.9	5.6	2.4	9
1986	4	nd[d]–0.05	nd–18.0	4.8–5.7	4.2–8.8	170–260

[a]Concentrations reported on basis of dry weight of gravel sample.
[b]Backgrounds estimated for counting procedure used in this study.
[c]Backgrounds estimated from several uncontaminated samples.
[d]Not detected.
Note: No measurements of metals were made for 1978 and 1985.
Source: Morrison and Cerling 1987.

Table 3.24. Preliminary survey results for WAG 9

Year	n	Gravels (radionuclides)[a] ^{60}Co (Bq/kg)	^{90}Sr (Bq/kg)	^{137}Cs (Bq/kg)	n	Gravels (metals)[a] Cd (µg/g)	Cr (µg/g)	Ni (µg/g)	Cu (µg/g)	Zn (µg/g)
BKGD[b]		<2	<10	3		0.05[c]	0.9[c]	5.6[c]	2.4[c]	9[c]
Site 24										
1978	3	11 ± 18	1,090 ± 194	294 ± 66						
1985	3	20+-8	363 ± 42	137 ± 31						
1986	1	13	290	120	3	<0.05–<0.3	7–10	3.6–5	1.9–3.5	16–17
Site 25										
1978	3	554 ± 320	44 ± 4	96 ± 173						
1985	3	413 ± 181	71 ± 25	167 ± 139						
1986	1	200	55	55	3	<0.05	3.8–9.3	1.5–3.4	0.3–1.6	10–21
Site 26										
1978	3	65 ± 24	2,475 ± 300	102,000 ± 22,000						
1985	3	31 ± 10	2,430 ± 1,710	40,000 ± 6,200						
1986	1	36	1,000	28,000	3	<0.05	0.8–1.5	3.9–4.5	1.0–2.3	10–13

[a]Concentrations reported on basis of dry weight of gravel sample.
[b]Backgrounds estimated for counting procedure used in this study.
[c]Backgrounds estimated from several uncontaminated samples.
Note: No samples for water or organics were taken. Blank spaces indicate no samples taken.
Source: Morrison and Cerling 1987.

Stream gravel samples from sites 16 and 23 verified that contamination due to Cr, Cu, P, and Zn also exists (Tables 3.22 and 3.23). The presence of these metals probably results from the discharge of HFIR cooling water. Water samples were not taken at any of the sampling sites in WAG 8, and no organic analyses were conducted. No organics were detected in samples from Sites 16 and 23. No water samples were taken at either site.

3.8.6 Regulatory Status of WAG 8

WAG 8 is reported to be the major point-source discharge of Co-60, and the HFIR cooling water appears to be the source of significant heavy metal contamination. As a result, it appears that an RI plan will be required for WAG 8.

SWMUs 8.4 (Hazardous Waste Storage Facility) and 8.8 (Mixed Waste Storage Pad) are scheduled for replacement by other storage facilities (located in WAG 19) in the near future and should be removed from consideration as potential sources of release when certified free of contaminants. SWMUs 8.5, 8.6, and 8.7 are still in service and have no reported releases. SWMU 8.9 is a sewage treatment plant (now used as a sewage holding tank) and should not represent a source of release of hazardous chemicals or radionuclides, and ORNL is currently in the process of submitting revising the NPDES permit application for SWMU 8.10. Thus, in WAG 8 only SWMUs 8.1a–d, 8.2, and 8.3a–g appear to require further remedial action consideration.

3.9 WAG 9—HOMOGENEOUS REACTOR EXPERIMENT (HRE) AREA

3.9.1 Location and Description of WAG 9

WAG 9 is located in Melton Valley about 0.6 mile (1.0 km) southeast of the ORNL main plant area (Fig. 1.1). There are three SWMUs in this WAG: the HRE pond (9.1); LLW collection and storage tanks (9.2); and a septic tank serving the HRE (9.3), now the Nuclear Safety Pilot Plant (NSPP). The locations of the SWMUs are shown in Fig. 3.10.

SWMU 9.1, the HRE pond, was constructed in 1955 as a waste storage impoundment for contaminated condensate from the HRE waste evaporator. Later, the pond was used for low-level shield water discarded during cell maintenance. The waste was chemically flocculated to accelerate settling in the pond. The capacity of the pond was 316,000 gal (1.2M L). In 1970, the impoundment was filled with soil and capped with asphalt.

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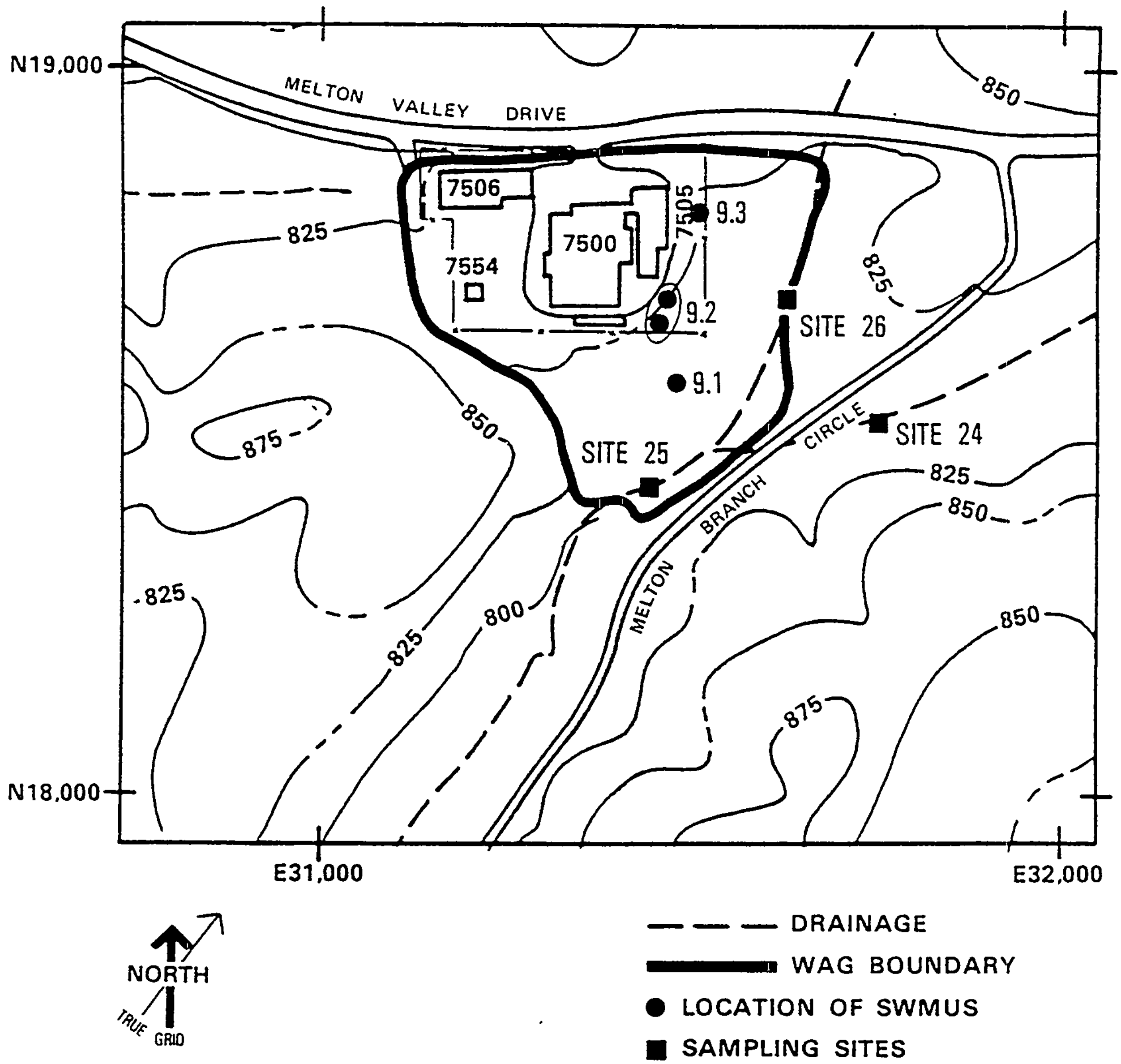

Fig. 3.10. WAG 9—Homogeneous Reactor Experiment Area.

SWMU 9.2 consists of two buried stainless steel tanks, one having a capacity of 1,000 gal (3,800 L) and the other 12,000 gal (46,000 L). The 1,000-gal tank is not in service, but the 12,000-gal tank was used at the NSPP for collection of LLW up to 1986.

SWMU 9.3 is a 1,400-gal (5,300-L) septic tank installed to handle domestic sewage from the HRE (now NSPP) facility. The tank services lavatories and should not contain any radioactive or hazardous wastes.

3.9.2 Geologic Description of WAG 9

WAG 9 is located in Melton Valley and is underlain by the units of the Conasauga Group of the middle and upper Cambrian Age. Weathering in units of the Conasauga Group extends to a depth of about 30–40 ft (9–12 m) under the low ridges and to a depth of about 10 ft (3 m) in the valleys. Thin layers and lenses of limestone are commonly found but generally are irregular in distribution. There are no persistent limestone beds reported in the area; no solution channels or caverns to permit rapid discharge of water have been reported. Regional stratigraphy and lithologic variations in the Conasauga Group have been described by Hassan and Haase (1982).

3.9.3 Hydrologic Description of WAG 9

Surface drainage is primarily to the south in a small tributary to Melton Branch. The extreme northwestern portion of the WAG contributes flow to a tributary that flows west to WOC. All of the SWMUs identified in the area have surface drainage to the south. There is a discharge monitoring station on the south tributary, which also receives flow from the eastern border of WAG 5 and the northwestern boundary of WAG 8. During 1985, flow volume was about 11% of that recorded for the gauging station on Melton Branch at the confluence with WOC. USGS records (Water Supply Paper 1706) for the 5-year period ending in 1960 show the average flow rate at Melton Branch to be 2.24 cfs. Thus, an estimated average surface flow rate for the tributary is 0.25 cfs.

Groundwater monitoring has been conducted at the Homogeneous Reactor Experiment impoundment, which was backfilled and capped in 1970 (Stansfield and Francis 1986). The water-table elevation map suggests that flow is to the south and east into the tributary that is described above. Hydraulic conductivities at sites in similiar geologic settings had geometric means on the order of 5×10^{-5} cm/s, and the effective porosity was estimated to be 0.03. Thus, flow from the uppermost aquifer is expected to be to the stream that drains to the south from the site.

3.9.4 Known Releases from WAG 9

Cerling and Spalding (1981) conducted stream gravel surveys on the unnamed tributary draining WAG 9 to Melton Branch and the branch tributary leading to the MSRE. Their survey showed that Sr-90 and Cs-137 contamination existed and that the probable source of this contamination was the HRE area, with the HRE pond being the major contributor of Cs-137 and additional Sr-90. The same general results were obtained in the 1986 survey (Cerling and Huff 1986).

Stansfield and Francis (1986) performed a characterization study on the HRE pond. As a part of the study, four groundwater wells were installed.

3.9.5 Preliminary Survey Data for WAG 9

Three sampling sites were used in the preliminary survey of WAG 9 (sites 24–26, Fig. 3.10). Site 24 is located on the tributary leading to the MSRE, and the stream gravels showed relatively high concentrations of Sr-90, some indication of Cs-137, and essentially background concentrations of Co-60 (Table 3.24). Both Sr-90 and Cs-137 concentrations were less than results from previous surveys. Chromium and to a lesser extent Zn and Cu were present at Site 24. Site 25 is used to examine releases from the NSPP. Cobalt-60, Sr-90, and Cs-137 concentrations at this site were above background concentrations along with Cr and Zn. Site 26 is on the drainage to the southeast of the HRE settling basin. Gravels show high concentrations of Sr-90 and Cs-137 but essentially background levels of heavy metals. Additional studies indicate that the release of Cs-137 from the pond is no longer occurring. Concentrations of Sr-90 and Cs-137 appear to be declining from 1978 to 1986 (Table 3.24). Organics were not detected in samples from the sites sampled.

3.9.6 Regulatory Status of WAG 9

WAG 9 appears to be a source of continuing release of Sr-90 and Cs-137 from both the HRE facility and the HRE settling basin. WAG 9 also receives releases of Sr-90 and Cs-137 from the MSRE area in WAG 8 through a stream drainage into the WAG (see Sect. 3.8.5). There is also an indication that contamination by Cr and Zn is occurring. Although a comparison of the stream gravel data taken in 1986 and 1978 appears to indicate that the releases are diminishing, releases are still occurring. An RI plan should be formulated for WAG 9. Although this WAG includes two underground radioactive waste storage tanks, there is no record of releases from these tanks; however, there does appear to be some indication of surface contamination resulting from overfilling or spillage that occurred while LLW was being removed from the tank. The other SWMU in WAG 9 is a septic tank that services the NSPP building. This tank should not be a source of radionuclides or hazardous chemicals.

The main concern in WAG 9 is represented by the HRE settling basin. This SWMU represents a source of continuing release of Sr-90 to the tributary draining the WAG 9 area.

3.10 WAG 10—HYDROFRACTURE INJECTION WELLS AND GROUT SHEETS

3.10.1 Location and Description of WAG 10

WAG 10 consists of the injection wells and grout sheets from four SWMUs, two of which were experimental sites used in the development of the hydrofracturing process at ORNL (SWMUs 10.1 and 10.2). The other two sites are operating facilities (now inactive) that were used to dispose of ORNL's LLW (SWMUs 10.3 and 10.4). All four SWMUs are located in Melton Valley; however, they are not adjacent to each other. The location of the four SWMUs included in WAG 10 is shown in Fig. 3.11 (which includes the units in WAGs 2 and 10). The ORNL grid coordinates of the injection wells are SWMU 10.1, N18,920 and E25,890; SWMU 10.2, N16,817 and E31,260; SWMU 10.3, N17,155 and E28,617; and SWMU 10.4, N16,502 and E28,178. WAG 10 does not include the surface facilities used for the hydrofracture injections. These surface facilities associated with SWMUs 10.3 and 10.4 are described as SWMUs 8.3 and 8.4, respectively (SWMUs 10.1 and 10.2 did not have permanent surface facilities). WAG 10 is significantly different from the other WAGs included in this report in that the grout sheets are located at depths of 300–1,000 ft (90–300 m) below the ground surface.

The grout sheets are thin (1-in.) layers of a solidified, cement-based LLW slurry that was injected into a fracture in the underground geologic structure (deLaguna et al. 1968). The fracture into which the slurry was pumped was initiated by pumping water under pressure into a slot cut into the injection well casing. The grout slurry was then pumped into the formation and allowed to harden. The slurry constituents were selected and formulated to produce a solid product that would retain the radionuclides in the LLW. Using this technique, it was felt that the radionuclides would be retained in the grout and would not be subject to groundwater transport.

In 1986, a well that had previously been drilled in the vicinity of the grout sheets showed the presence of water containing radionuclides (principally Sr-90) at the approximate depth of the grout sheets. Since this occurrence, further injections of grout have been discontinued, and closure of ORNL's hydrofracture facilities has begun.

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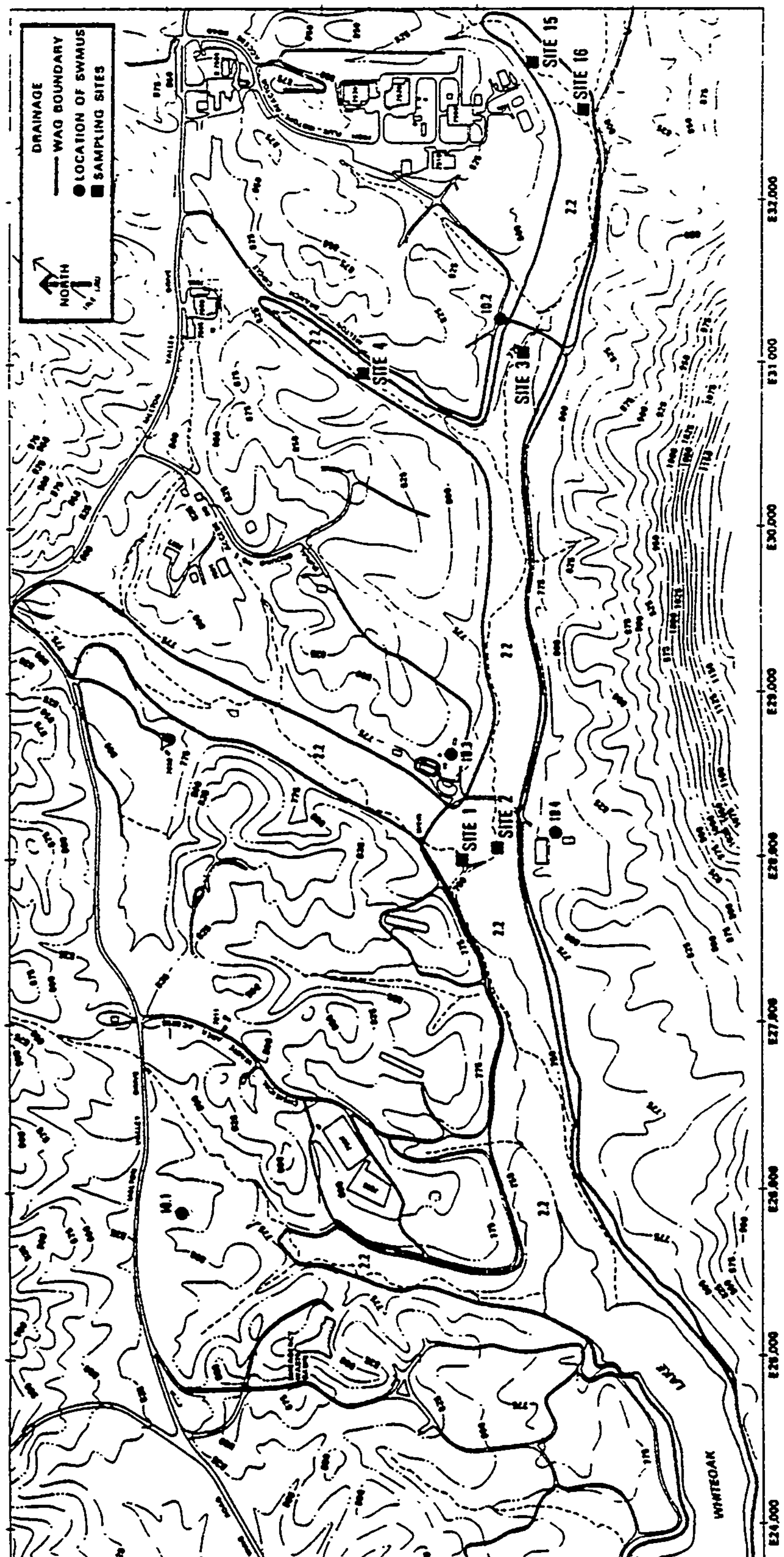

Fig. 3.11. WAG 10—Hydrofracture Injection Wells and Grout Sheets.

Appendix A provides detailed information on the history of hydrofracturing at ORNL, along with data on the quantity and composition of the wastes injected.

3.10.2 Geologic Description of WAG 10

The geologic formation used for injections at the four hydrofracture sites was the Pumpkin Valley Shale, the lowest formation in the Conasauga Group. The Pumpkin Valley Shale (which is overlain by the Rutledge Limestone) is a 300-ft- (90-m-) thick, thinly bedded, illitic shale that breaks easily along bedding planes. The Conasauga Group is underlain by the Rome Formation (a silty sandstone) and is overlain by the Knox Group, consisting chiefly of cherty dolomite. The Pumpkin Valley Shale is confined on the top by the Rutledge Limestone and on the bottom by the Rogersville Formation of the Rome Group.

3.10.3 Hydrologic Description of WAG 10

Very little information exists on groundwater movement at the injection depths in Melton Valley. One of the basic assumptions in the development of this disposal technique was that the Pumpkin Valley Shale was highly impermeable and would interact hydrologically seldom, if at all, with the overlying or underlying formations. Groundwaters from these formations are generally extremely saline, suggesting the lack of hydrologic connection with more shallow groundwaters. Of the three underlying geologic units, only the Knox Group is recognized as a regional aquifer, providing fresh water at shallow depths. Nothing is known of water quality in the Knox Group at the depth below the hydrofracture injection zone [3,000–5,000 ft (915–1,525 m)].

3.10.4 General Information on Known Releases from WAG 10

Two separate incidents have been reported in which water from the grout sheets has been released through wells drilled into the grout sheets. Two of the deep monitoring (DM) wells have shown concentrations of 94,000 to 400,000 Bq/L. The third DM well showed no contamination (Oak Ridge National Laboratory 1987). Additional information is included in Appendix A.

3.10.5 Preliminary Survey Data for WAG 10

WAG 10 was not included in the Morrison and Cerling (1987) survey conducted in 1986. Although radionuclides have been detected in wells drilled into the grout sheets from earlier LLW injections, there is no existing information to suggest that the radionuclides have migrated from the grout sheets to surface streams within the ORNL area. Releases by surface spills or leaks related to hydrofracture well drilling and monitoring operations have occured in drainage areas that are included in the preliminary studies for other WAGs.

3.10.6 Regulatory Status of WAG 10

Documentation is being prepared to initiate the closure of the hydrofracture facilities. An RI plan has been prepared (Oak Ridge National Laboratory 1987) for the hydrofracture wells and grout sheets.

3.11 WAG 11—WHITE WING SCRAP YARD

3.11.1 Location and Description of WAG 11

The White Wing Scrap Yard (WAG 11) is a roughly 20-acre (8-ha), largely wooded area located in the McNew Hollow area on the western edge of East Fork Ridge. It is 0.9 mile (1.5 km) east of the junction of White Wing Road and the Oak Ridge Turnpike and is roughly contained within Oak Ridge Gaseous Diffusion Plant (ORGDP) grid coordinates N 35,000–35,800 and E 27,500–29,250 (Fig. 3.12). There is only one SWMU in WAG 11.

White Wing Scrap Yard was used for the aboveground storage of contaminated material from ORNL, ORGDP, and the Y-12 Plant. The material consisted largely of contaminated steel tanks, trucks, earth-moving equipment, and assorted large pieces of steel, stainless steel, and aluminum, as well as reaction vessels used in Building 3019.

The area began receiving material in the early 1950s. However, the precise dates of material storage are uncertain, as is the time when the area was closed to further storage. In 1966, efforts were begun to clean up the area by a combination of the disposal of contaminated materials in ORNL's SWSA 5 and the sale of uncontaminated material to an outside contractor for scrap. Cleanup continued at least into March 1970, and in October 1970 removal of about 6,000 yd^3 (4,585 m^3) of contaminated soil began. Some scrap metal, concrete, and other trash is still located

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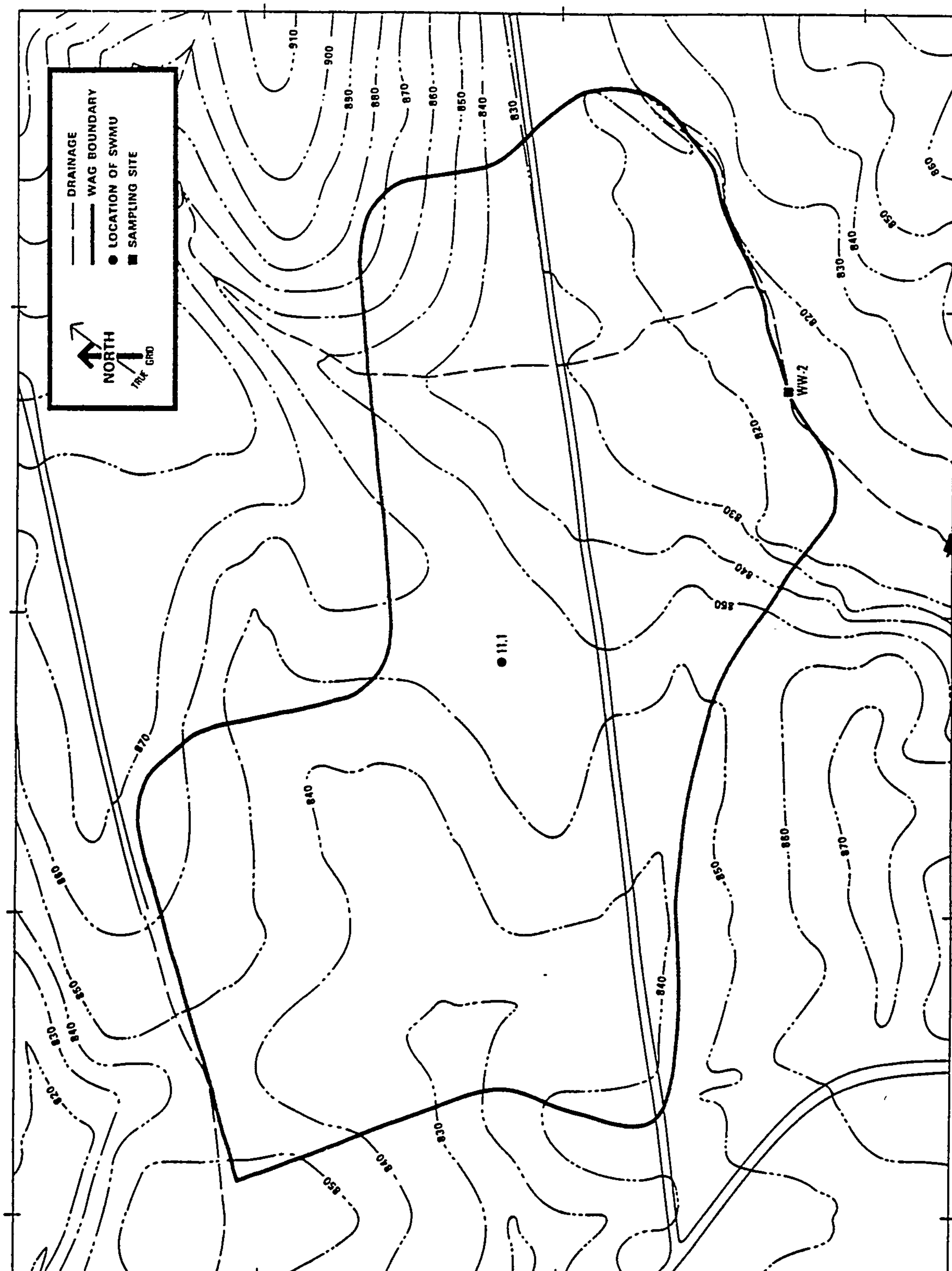

Fig. 3.12. WAG 11—White Wing Scrap Yard.

in the area. Most of the area is now enclosed by a chain link fence; however, about 3 acres (1.2 ha) is partially open and enclosed by a barbed wire fence. The area is overgrown with weeds, trees, and other types of vegetation. The amount of material or contaminated soil remaining in the area is not known.

3.11.2 Geologic Description of WAG 11

The scrap yard occupies an area of gently rolling terrain underlain mostly by bedrock of the Knox Group, which consists of dolomites containing varying amounts of chert and minor amounts of limestone, shale, and sandstone. A thrust fault (one of several that comprise the White Oak Mountain Thrust Zone) is inferred to pass through the southern portion of the scrap yard area, trending from southwest to northeast. Bedrock south of the thrust fault is mapped as shale of the lower portion of the Rome Formation.

3.11.3 Hydrologic Description of WAG 11

Surface water runoff from the site flows to one of two watersheds, both of which ultimately drain to the lower reaches of Bear Creek. An unnamed creek receives surface runoff from the eastern portion of the site and carries perennial flow southward to Bear Creek. The second surface water flow path leaves the site to the southwest but does not carry flow perennially.

Groundwater flow from the southern and eastern portions of the site is presumed to flow to the perennial creek that drains the site. Groundwater flow from the central and northwestern portions of the site is presumed to flow along the axis of the dry valley that carries ephemeral flow to the southwest. An array of 14 piezometers is currently being installed to determine groundwater flow at the site.

3.11.4 Known Releases from WAG 11

The waste stored was largely metal, glass, concrete, and trash with alpha, beta, and gamma contamination. Plutonium-239 contamination of the reaction vessels is estimated at roughly 0.05 lb (25 g). Information regarding possible hazardous waste contamination has not been found.

A walk-over survey in June 1971 detected surface radiation levels up to 5 mrad/h. An aerial radiation survey conducted in 1974 detected gamma radiation (0.8–6 mR/h), principally from Cs-137 (0.5–4 mR/h).

3.11.5 Preliminary Survey Data for WAG 11

In the fall of 1986, Morrison and Cerling (1987) performed a limited sampling program using water, mud, and stream sediment samples from two locations to identify if hazardous materials had been or are being released from the scrap metal yard. One site (WW-2) was a moist creek bed within the scrap yard, and the second site (WW-1) was located south of the yard where the stream passes under Highway 95 (Fig. 3.12). At site WW-1, the creek flow was less than 1 gal/min (3.8 L/min) and was backed up into a pool [about 1.6 ft (0.5 m) deep] about 16 ft (5 m) west of the bridge on Highway 95. Samples of stream gravels and dark mud were collected at WW-1 and WW-2, and water samples were taken from the pool at WW-1 (no flow existed at WW-2 at the time sampling was performed).

Table 3.25 summarizes the results of the preliminary studies. For the extractable metals from the stream gravel samples, only Ni was found in concentrations exceeding background. Whether

Table 3.25 Preliminary survey results from WAG 11 in 1986

Element	BKGD	WW-1	WW-2
		Gravels[a]	
Co-60[b]	<2	<6	<6
Sr-90[b]	<10	38±40	17.3±1.5
Cs-137[b]	3	<7	<7
Cd[c]	0.5	*d*	*d*
Cr[c]	0.05	*d*	*d*
Cu[c]	0.9	*d*	1.5
Ni[c]	0.6	8.2±3.3	11.6±3.2
Zn[c]	9	9.3±2.9	8.4±1.1
		Water (Bq/L)	
Co-60	<0.2	<0.3	
Sr-90	<0.2	<0.25	
Cs-137	<0.2	<0.4	
		Organics (μg/kg)	
Di-n-butylphthalate		540	850

[a]Concentrations reported on basis of dry weight of gravel sample. Radionuclides in Bq/kg. Metals in μg/g.

[b]Backgrounds estimated for counting procedure used in this study.

[c]Backgrounds estimated from several uncontaminated samples.

[d]Not detected.

Note: Site WW-1, 3 samples. Site WW-2, 1–3 samples. No water sample taken at WW-2.

Source: Morrison and Cerling 1987.

this is because of releases from the scrap yard or the natural environment cannot be determined from the survey data. Radionuclide concentrations in the stream gravels were below detection limits for Co-60 and Cs-137; however, the samples taken at site WW-1 showed an average Sr-90 concentration of 38 Bq/kg. This suggests a possibility of Sr-90 release from the scrap yard. In addition, one water sample from site WW-1 had a low (0.25 Bq/L) but detectable concentration of Sr-90.

Di-n-butylphthalate was the only organic detected the two mud samples (one from each site). Phthalate, a component of plastic materials, is common in sediments; however, the concentrations are relatively low.

In summary, Morrison and Cerling stated that except for the possibility of Ni and Sr-90, no significant contamination was observed for WAG 11. They suggest that the source of the Ni or Sr-90 contamination could be determined by a follow-up sampling program using sites upstream from WAG 11 as control points.

3.11.6 Regulatory Status of WAG 11

Based on the background information on contamination at WAG 11 and the results of the scoping studies, there are still unresolved concerns regarding the possibility of WAG 11 requiring further Section 3004(u) remedial action. Prior to any decision on the need for preparing an RI plan for WAG 11, additional stream gravel and mud sampling along with soil sampling and additional beta-gamma walk-over surveys should be undertaken. As noted in the hydrology section (Sect. 3.11.4), piezometers are being installed in WAG 11 to establish better information on groundwater movement in the area. A decision on the need for an RI for WAG 11 should be deferred pending results from additional field sampling and groundwater movement studies.

3.12 WAG 12—CLOSED CONTRACTORS' LANDFILL

3.12.1 Location and Description of WAG 12

The Closed Contractors' Landfill is the only SWMU in WAG 12. It was used to bury general construction debris generated by contractors working at ORNL (Nix et al. 1986). SWMU 12.1 is located about 1.4 miles (2.2 km) ESE of WAG 1 (Main Plant Area) and about 500 ft (152 m) ENE of the intersection of Melton Valley Access Road at ORNL grid coordinates N 18,650 and

E 37,500 (Fig. 3.13). SWMU 12.1 is approximately 505 ft (154 m) long (in the east-west direction), and 259 ft (79 m) wide (in the north-south direction). The approximate area is about 2.9 acres (1.2 ha). The original land surface sloped from north to south so that the depth of fill probably ranges from less than 6 ft (1.8 m) on the north side to about 30 ft (9 m) on the south. Estimates of the amount of material buried ranges from 1.06×10^6 to 1.77×10^6 ft^3 (30,000 to 50,000 m^3) depending on the depth of excavation, the existence of natural depressions, and the degree of compaction of the waste, if any.

The landfill functioned as the disposal point for ORNL contractors' construction and demolition waste from 1950 until 1975 when disposal stopped and the site was graded level and seeded with grass. No waste-specific records were kept on the landfill operation, and no administrative controls were maintained on the nature of the waste being buried. As a result, construction waste sent to the landfill probably included empty paint cans and other debris that could include small amounts of hazardous waste.

3.12.2 Geologic Description of WAG 12

Available geologic information for eastern Melton Valley indicates that WAG 12 is underlain by four formations of the Conasauga Group: the Nolichucky Shale, Maryville Limestone, Rodgersville Shale, and Rutledge Limestone (from youngest to oldest). The lithology of the formations is complex, but they are generally composed of interbedded limestones, shales, and siltstones (Rothschild et al. 1984a). The upper portion of the Nolichucky Shale (the uppermost formation) consists of complexly interbedded calcareous shale/mudstone and limestone lithologies; the lower portion is composed of numerous repeated cycles of shale and limestone.

3.12.3 Hydrologic Description of WAG 12

WAG 12 is in the Bearden Creek drainage area, which drains a small area east of ORNL in Bethel and Melton valleys to the Clinch River. The WAG is flanked on the east and west by two small streams that join to the southeast and flow into Bearden Creek. The topography of the area suggests that shallow groundwater also flows toward Bearden Creek or its tributaries.

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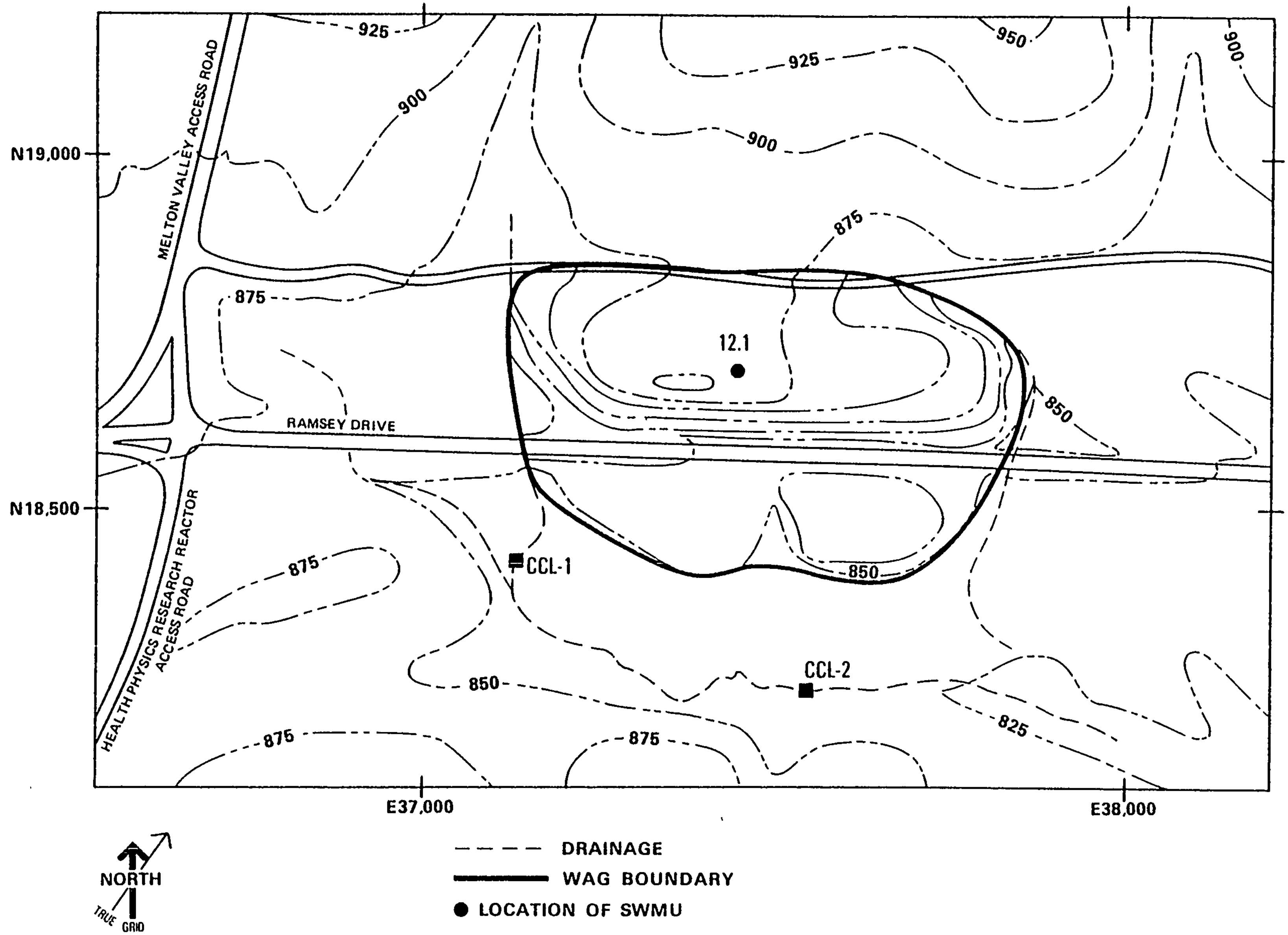

Fig. 3.13. WAG 12—Closed Contractors' Landfill.

3.12.4 Known Releases from WAG 12

No records indicate that WAG 12 represents a source of release of radioactive or hazardous materials. Aerial radiation surveys (Boyne 1980) and walkover radiation surveys (3 ft above land surface) have not detected radiation levels above background. No visible leakage or seeps have been observed or documented.

3.12.5 Preliminary Survey Data for WAG 12

As it currently exists, the Contractors' Landfill resembles a plateau on which disabled construction material is stored. The plateau drains south and passes under Ramsey Drive before taking a sharp bend to the east. The streambed at the time of sampling was moist, but no water was flowing. Two sampling sites (CCL-1 and CCL-2) were located about 984 ft (300 m) apart along the streambed (Fig. 3.13). Gravel and dark mud samples were taken at each site. Because of the absence of flow in the streambed, no water samples were taken.

One gravel sample had a nickel concentration (7.2 $\mu g/g$) above background, but other metal values were either below detection limits or only slightly above (Table 3.26). The nickel concentration of 7.2 $\mu g/g$ (which is about twice background) may be related to lithologic variation. Concentrations of Co-60, Sr-90, and Cs-137 were near background levels. In the analyses for organics, one

Table 3.26 Preliminary survey results from WAG 12 in 1986

Element	BKGD	CCL-1	CCL-2
		Gravels[a]	
Co-60[b]	<2	<7	<7
Sr-90[b]	<10	14.3±2.1	11.1±6.0
Cs-137[b]	3	<7	<7
Cd[c]	0.5	*d*	*d*
Cr[c]	0.05	*d*	*d*
Cu[c]	0.9	<2	<2
Ni[c]	0.6	4.5±0.4	6.4±0.8
Zn[c]	9	14.5±3.9	9.0±2.4
		Organics	
Di-n-butylphthalate			1,200

[a]Concentrations reported on basis of dry weight of gravel sample. Radionuclides in Bq/kg. Metals in $\mu g/g$.
[b]Backgrounds estimated for counting procedure used in this study.
[c]Backgrounds estimated from several uncontaminated samples.
[d]Not detected.
Source: Morrison and Cerling 1987.

sample from site CCL-2 contained the highest concentration (1,200 μg/kg) of di-n-butylphthalate found in the entire survey of 20 WAGs. As previously mentioned, these organics are a common component in plastic materials and are often found in sediments. No other semivolatile organics were detected.

3.12.6 Regulatory Status of WAG 12

Based on the results of the surveys of Morrison and Cerling and existing information on the types of waste supposedly buried in the Contractors' Landfill, WAG 12 does not appear to require an RI plan; however, ORNL suggests that additional surveys for organic contaminants be conducted to verify the absence of releases.

3.13 WAG 13—ENVIRONMENTAL RESEARCH AREAS

3.13.1 Location and Description of WAG 13

WAG 13 includes two environmental research areas and is a part of what is called the 0800 Area (Fig. 1.1). The two SWMUs in WAG 13 are located about 1,300 ft (400 m) apart in separate parts of the WAG (Fig. 3.14). This area (0800 Area) was the site of a number of simulated fallout experiments using Cs-137.

SWMU 13.1 consists of a 5-acre (2-ha) fenced area in a fescue grassland community approximately 330 ft (100 m) north of the Clinch River at mile 20.5 (33 km) (Auerbach 1969; Auerbach and Dunaway 1970; and Auerbach et al. 1973). The site included eight 33- by 33-ft (10- by 10-m) treatment plots, each of which of which was enclosed by metal sheeting 18 in. (46 cm) below the surface and 24 in. (61 cm) above the ground. In August of 1968, four of the plots were contaminated with Cs-137 fused at high temperatures to silica particles (88–177 μm diameter), and the remaining four plots were used as controls. Each enclosed plot received approximately 2.2 Ci (8.1×10^{10} Bq) of Cs-137, or a total of 8.8 Ci (3.3×10^{11} Bq) to the site. The particle size distribution was selected to simulate particle size characteristics of nuclear weapons fallout. During the period of experimental observation, samples of vegetation clippings and soil cores were removed from the enclosures, analyzed, and disposed of elsewhere. Since the Cs-137 was applied over 18 years ago, radioactive decay (~0.6 half-life) has reduced the remaining radioactivity to less than 5.7 Ci (2.1×10^{11} Bq), assuming that no particle losses due to weathering, runoff, or wind transport occurred. The site is presently inactive.

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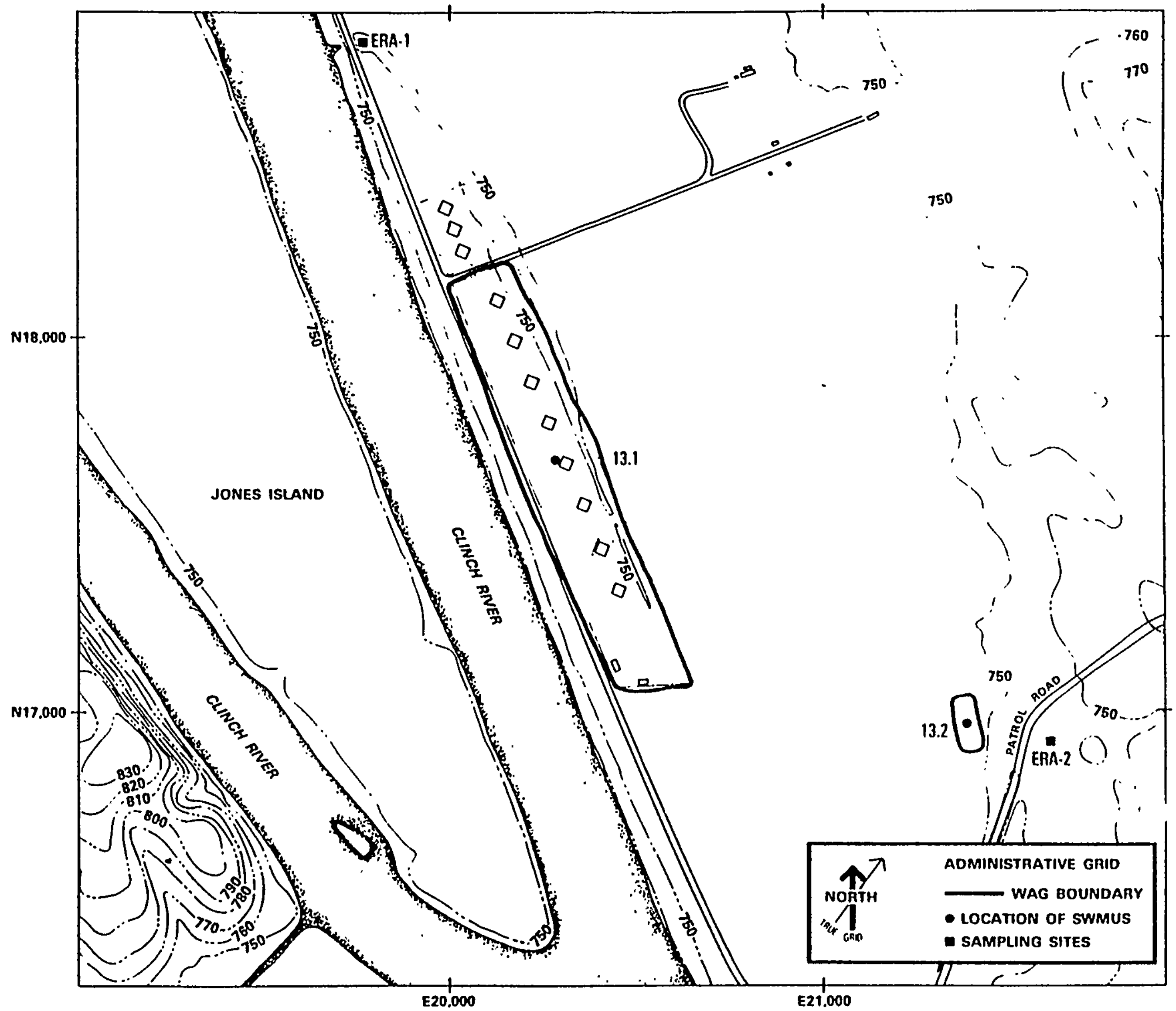

Fig. 3.14. WAG 13—Environmental Research Areas.

Numerous experiments with shorter half-life isotopes have been conducted in the vicinity of the cesium plots; however, the isotopes are no longer present in detectable amounts (Taylor 1986).

SWMU 13.2 was an experimental area used to study Cs-137 runoff, erosion, and infiltration on a silt-loam soil (Rogowski and Tamura 1965, 1970a, 1970b; Tamura 1967). This study was also related to ORNL's Civil Defense Program. The isotope in this experiment was sprayed as a liquid on soils having varying degrees of ground cover. A total of 15 mCi (5.6×10^8 Bq) of Cs-137 was used; the area contaminated was less than 215 ft^2 (20 m^2). Since the isotope was applied on October 20, 1964, approximately 0.72 half-life has passed, and the maximum amount of radioactivity remaining should be about 9.1 mCi (3.4×10^8 Bq). The site is currently inactive.

3.13.2 Geologic Description of WAG 13

WAG 13 is underlain by the Conasauga Group.

3.13.3 Hydrologic Description of WAG 13

Surface runoff from the portion of WAG 13 that is adjacent to the Clinch River flows northwest and parallel to the river for approximately 800 ft (245 m) between the northern edge of the WAG and the confluence. The small stream is intermittent and only flows during the wettest part of the year. Drainage from the portion of WAG 13 that drains the erosion experiment area (SWMU 13.2) flows to the southwest into the White Oak Creek embayment. This stream is also intermittent.

Groundwater flow in the western portion of the WAG is presumed to be west toward the Clinch River. Similarly, the eastern portion of the WAG is presumed to exhibit groundwater flow toward the small unnamed tributary that drains to the south, based on local topography. In both areas groundwater flow could be influenced by channel features that have been filled by river deposits.

3.13.4 Known Releases from WAG 13

Because the basic premise behind the experiments conducted in the two SWMUs was to evaluate the movement of Cs-137 resulting from nuclear weapons fallout, it follows that some of the activity applied was released from the sites.

3.13.5 Preliminary Survey Data for WAG 13

Morrison and Cerling (1987) sampled stream soils (sites were reported to have no gravels) in WAG 13 as part of the survey (see Fig. 3.14 for location of sampling points). No mud samples were taken, and no organic analyses performed. At the time of sampling no flow was occurring at either of the two sites. Only one sample was taken at each site. At SWMU 13.1, there was evidence of Cs-137 and possibly Sr-90 contamination (Table 3.27). At SWMU 13.2, the Cs-137 concentration was slightly above detectable levels; however, Sr-90 was about 4 times the background levels for the Conasauga Group.

An aerial radiometric survey conducted in 1986 of the WOC/WOL watershed shows the presence of Cs-137 in SWMU 13.1; however, SWMU 13.2 does not show on the radiometric maps as a distinguishable source of radiation.

3.13.6 Regulatory Status of WAG 13

Before implementing further remedial action on the sites included in WAG 13, additional surveys should be undertaken. For SWMU 13.1, only one sample was taken about 300 ft (91 m)

Table 3.27. Preliminary survey results for WAG 13[a]

Element	BKGD	ERA-1	ERA-2
		Gravels[a]	
Co-60[b]	<2	<7	<5
Sr-90[b]	<10	21	41
Cs-137[b]	3	390	<6
Cd[c]	0.5	0.3	*d*
Cr[c]	0.05	*d*	*d*
Cu[c]	0.9	*d*	*d*
Ni[c]	0.6	*d*	*d*
Zn[c]	9	11	1.3

[a]Concentrations reported on basis of dry weight of gravel sample. Radionuclides in Bq/kg. Metals in μg/g.

[b]Backgrounds estimated for counting procedure used in this study.

[c]Backgrounds estimated from several uncontaminated samples.

[d]Not detected.

Note: ERA-1 (soil, one sample; no water or mud samples). ERA-2 (soil, one sample; no water or mud samples).

Source: Morrison and Cerling 1987.

northwest of the field plots. Additional sampling along the stretch of the dry streambed should provide some indication of potential movement of Cs-137. Sampling during rainfall would provide some indication of the quality of the runoff from the plots. In the case of SWMU 13.2, the stream gravel survey conducted in 1986 did not locate contamination due to Cs-137. The amount of Cs-137 calculated to remain at the site is very small; in fact, most of the remaining isotope may already have been removed or may have migrated from the site. Pending additional sampling surveys on the two SWMUs in WAG 13, it is recommended that further remedial action planning be deferred. However, based on the data currently available, releases from WAG 13 are minimal.

3.14. WAG 14—TOWER SHIELDING FACILITY (TSF)

3.14.1 Location and Description of WAG 14

The Tower Shielding Facility (TSF, WAG 14) is located about 2.2 miles (3.5–4 km) south of the ORNL main plant area (WAG 1). The location of WAG 14 and its two associated SWMUs is shown in Fig. 3.15.

The facility was constructed in 1954 to provide an economical means for obtaining shielding performance data free from ground scatter or structure scatter for use in the development of portable reactors. This objective was accomplished by placing a small, low-power reactor in a cylindrical tank and measuring the radiation from the reactor at various angles while the reactor and tank were suspended about 200 ft (60 m) above the ground. Four large towers [about 330 ft (100 m) high] were installed from which to suspend reactors and their associated measuring equipment. The towers have also been used for drop testing of transportable shielding containers (casks).

SWMU 14.1 (TSF Scrap Yard) is an accumulation of used vessels, tanks, and drums that have collected over time as a result of work conducted at the facility. In addition to the scrap materials, there are about three hundred 55-gal drums of sodium that are used for shielding. One of these drums shows evidence of earlier leakage but appears to have sealed itself; all of the other drums appear to be adequate for containment. Also present at the site are sheets of depleted uranium.

SWMU 14.2 is a septic tank installed to provide sewage treatment services for personnel employed at the site. No evidence exists to indicate that any hazardous materials have been discharged to the tank. Sludge from the tank is pumped into a tank truck and transported to the ORNL sewage treatment facilities for treatment.

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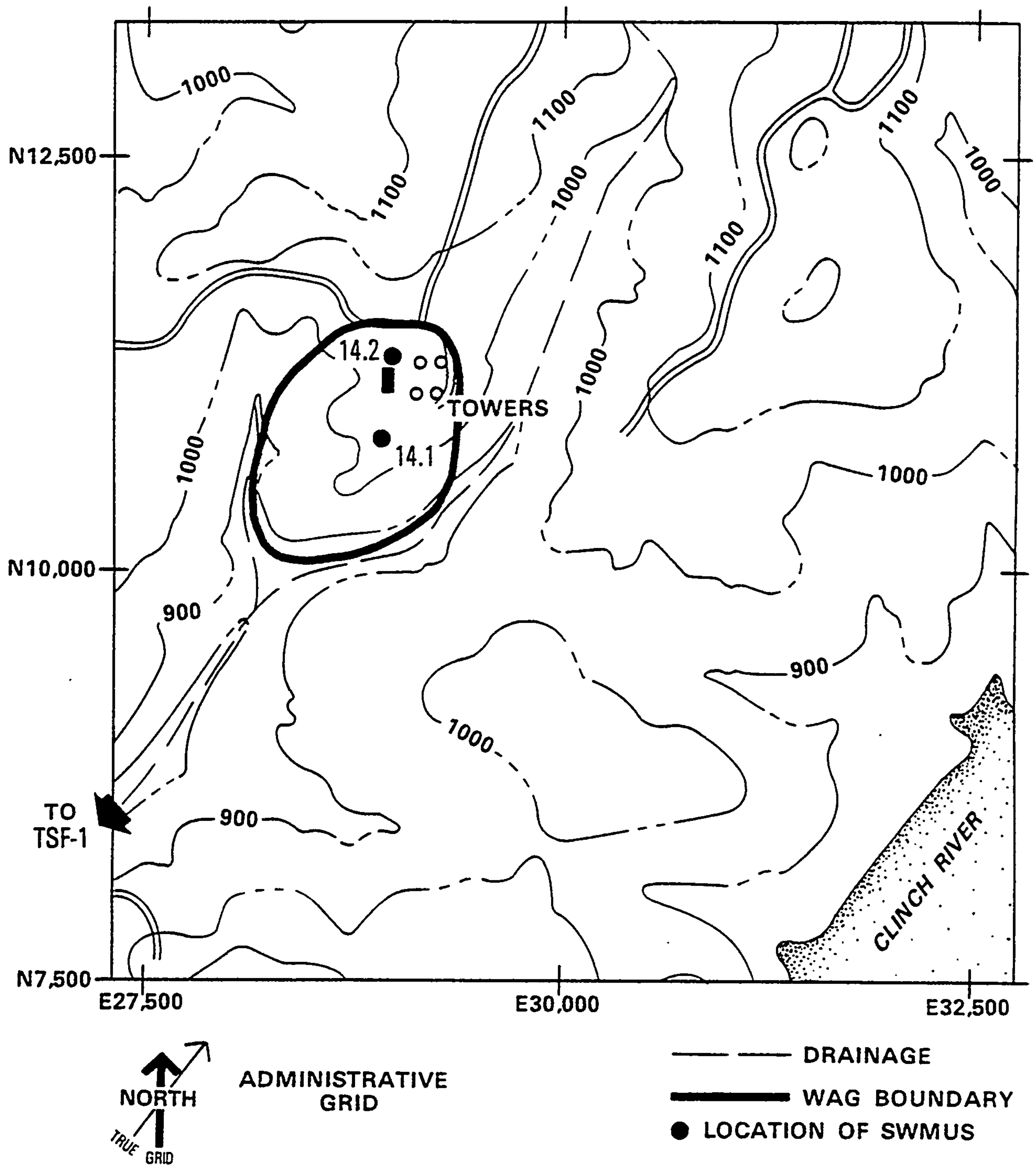

Fig. 3.15. WAG 14—Tower Shielding Facility.

3.14.2 Geologic Description of WAG 14

The formation underlying WAG 14 is described as gray, bedded dolomitic limestone of the Knox Formation interbedded with conspicuous chert zones. The formation is about 2,600 ft (800 m) thick and without prominent faults in the vicinity of the site. The overlying soil is mainly silty clay, usually red but in some places yellow, interspersed with hard cherts of various sizes.

3.14.3 Hydrologic Description of WAG 14

WAG 14 does not drain to the WOC watershed. Instead, drainage from the site flows to unnamed drainageways on the east and west side of the facility. The two drainageways combine about 1,640 ft (0.5 km) southwest of the facility and then flow south to the Clinch River, entering just below Melton Hill Dam.

3.14.4 Known Releases from WAG 14

There is no reported information of releases of hazardous materials from operation of this facility. However, some of the scrap materials currently located at the site contain induced radioactivity because of past use. Initial contaminant scoping studies (Houser and Simpson 1986) indicate that there are no significant exposure hazards caused by the induced activity. At the present time, some cleanup of the site and removal of the inactive sodium tank is under way under the ORNL Surplus Contaminated Facilities Program (SCFP).

3.14.5 Preliminary Survey Data for WAG 14

Morrison and Cerling (1987) performed a survey of WAG 14 in the fall of 1986. Samples of stream gravels, sediment, and water were taken from the creek southwest of the site and analyzed for radionuclides, metals, and organics. The location of the sampling site relative to the Tower Shielding Facility is shown in Fig. 3.15. Results of this survey showed that gamma and alpha activity of the gravels was at or below background levels; however, the Sr-90 values were reported to be slightly above background levels (Table 3.28). A single water sample taken at this site indicated background levels for Cs-137, Co-60, and Sr-90. Analysis of the gravels for metals did not indicate elevated concentrations. The mud sample showed two of the organics of concern at levels above detection limits.

Table 3.28. Preliminary survey results for WAG 14

Element	BKGD	TSF-1
		Gravels[a]
Co-60[b]	<2	<4
Sr-90[b]	<10	18.7 ± 10.1
Cs-137[b]	3	<6
Cd[c]	0.05	*d*
Cr[c]	0.9	*d*
Cu[c]	2.4	*d*
Ni[c]	5.6	*d*
Zn[c]	9	*d*
		Water (Bq/L)
Co-60	<0.2	<0.3
Sr-90	<0.2	0.15
Cs-137	<0.2	<0.2
		Muds (μg/kg)
Di-n-butylphthalate		429
Phenanthrene		*c*
Anthracene		*c*
Fluoranthene		*c*
Pyrene		*c*
Benzo(a)anthracene		*c*
Chrysene		*c*
Benzo(b)fluoranthene		*c*
Benzo(k)fluoranthene		*c*
Benzo(a)pyrene		*c*
Indeno(1,2,3-cd)pyrene		*c*
Benzo(g,h,i)perilyne		*c*
Bis(2-ethylhexyl)phthalate		*c*
Butylbenzylphthalate		396

[a]Concentrations reported on basis of dry weight of gravel sample. Radionuclides in Bq/kg. Metals in μg/g.

[b]Backgrounds estimated for counting procedure used in this study.

[c]Backgrounds estimated from several uncontaminated samples.

[d]Not detected.

Note: TSF-1 (gravel, three samples analyzed for radionuclides, and two for metals; water, one sample analyzed for radionuclides; muds, one sample analyzed for organics).

Source: Morrison and Cerling 1987.

3.14.6 Regulatory Status of WAG 14

Based on results of the SCFP contaminant scoping surveys of Houser and Simpson (1986) and the WAG scoping surveys of Morrison and Cerling (1987), it appears that WAG 14 has not produced past releases of hazardous materials to the environment and does not presently represent a source of release. Furthermore, the cleanup operations planned for this facility under the SCFP should eliminate the concern for future releases. ORNL suggests that WAG 14 be deleted from further consideration as a RCRA Section 3004(u) site and that action beyond cleanup of the site be terminated.

3.15. WAG 15—ORNL FACILITIES AT THE Y-12 PLANT

3.15.1 Location and Description of WAG 15

A number of ORNL divisions occupy building space at the Oak Ridge Y-12 Plant. Waste resulting from these operations is handled by the Y-12 Plant waste handling systems, which are not included in the scope of this RCRA Feasibility Assessment. However, two SWMUs are the responsibility of the ORNL Remedial Action Program. These are (1) SWMU 15.1, cyclotron Z-oil storage at Building 9201-2 and (2) SWMU 15.2, a number of transformer and capacitor storage sites (Fig. 3.16).

The Z-oil was used in the ORNL 86-inch Cyclotron located in Building 9201-2. This cyclotron was dedicated to the production of radionuclides used in medical diagnosis and treatment and for industrial applications. The cyclotron was taken out of service in 1983. The Z-oil is reported to contain <50 ppm PCBs and may be contaminated with radionuclides. The inventory of Z-oil has been reduced from 15,000 to 7,000 gal (56,780 to 26,500 L); this oil will remain until decommissioning activities for the cyclotron are initiated.

The transformers and capacitors located in buildings 9201-2, 9204-1, 9204-3, and the SY 200 Scrap Yard were originally retained as spares for ORNL isotope production activities. These units contained oil having PCB concentrations ranging from 50 to >500 ppm. Capacity of the units ranges from small transformers and capacitors [2 gal (7.6 L])] to five 2,200-gal (8,328-L) transformers that were stored at the SY 200 Scrap Yard. During 1986, all of the surplus transformers and capacitors were removed from the ORNL areas at the Y-12 Plant and transferred to subcontractors for disposal.

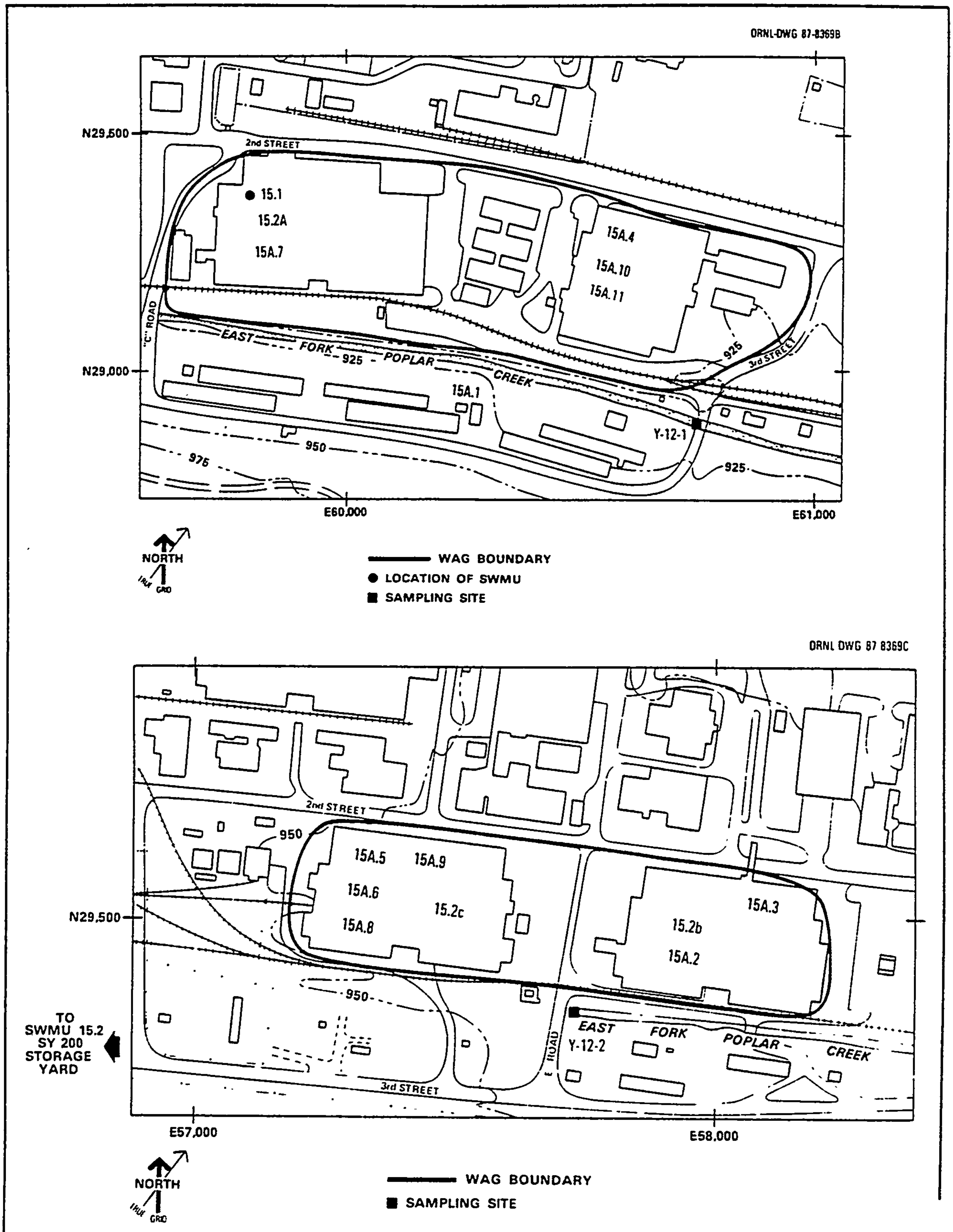

Fig. 3.16. WAG 15—ORNL Facilities at the Y-12 Plant.

In addition to the two SWMUs described above, there are 14 surplus facility sites (non-SWMUs) located within the Y-12 Plant (Table 1.1). The cleanup of these sites will generate wastes that will require disposal at either ORNL or Y-12 Plant disposal facilities.

3.15.2 Geologic Description of WAG 15

The Y-12 Plant is located within Bear Creek Valley, which is bounded by Pine Ridge to the north and Chestnut Ridge to the south. The valley is underlain by rocks of the Cambrian-aged Conasauga Group (Maynardville, Nolichucky, Maryville, Rogersville, Rutledge, and Pumpkin Valley formations, in descending order). Pine Ridge is supported by sandy shales and sandstones of the Rome Formation, and Chestnut Ridge is underlain by dolomite of the Knox Group. The valley lies within the White Oak Mountain thrust block, and the geologic strike of strata in the area is approximately N 55°E with a dip of approximately 45°SE.

3.15.3 Hydrologic Description of WAG 15

Surface runoff in the area of interest is strongly controlled by storm drains and man-made channels. All flow for the areas other than the SY 200 Scrap Yard discharges into upper East Fork Poplar Creek. Ultimately, flow passes through New Hope Pond and past a flow monitoring station there. Discharge records are maintained for that site by the Y-12 Environmental Management staff. The runoff from the SY 200 Scrap Yard flows into the headwaters of Bear Creek, which is monitored at a permanent gauging station near Highway 95. Both Bear Creek and East Fork Poplar Creek eventually discharge into the Clinch River.

Groundwater flow in the Conasauga Group formations underlying the site occurs in the weathered saprolite and is generally toward the nearest surface stream. There are indications that the Maynardville Limestone, which is present under the site, contains fractures and solution features. In these areas, flow is influenced by increased permeability along geologic strike (Geraghty & Miller, Inc., Y/Sub/85-00206C/3, June 1985). In addition, the presence of underground piping and sump pumps also exerts control on local groundwater flow. Hydraulic conductivity has been determined by pump test (Law Engineering Testing Company, Y/Sub/83-47936/1, 1983). Two reported values for the unconsolidated material overlying the interbedded sediments of the Conasauga Group were 7.34×10^{-4} and 9.44×10^{-5} cm/s.

3.15.4 General Information on Known Releases from WAG 15

The two SWMUs at the Y-12 Plant are (1) areas where surplus transformers and capacitors containing PCBs were located and (2) Building 9201-2, where ORNL operated a cyclotron using Z-oil as the coolant. There have been no reported releases of the Z-oil. In the case of the transformers and capacitors, records indicate that PCB-contaminated oils have leaked from one transformer located at the SY 200 Scrap Yard. The oil from the transformers stored at the SY 200 Scrap Yard had PCB concentrations ranging from 2 to 17 ppm (T. W. Burwinkle, personal communication) and has been reclaimed. Thus, any spills of this oil should not result in gross PCB contamination.

3.15.5 Preliminary Survey Data for WAG 15

Morrison and Cerling (1987) sampled Poplar Creek, which is the main drainage for the southern portion of the Y-12 Plant site at two points: (1) at its western end, south of Building 9204-1, and (2) east of Building 9201-2, where the creek passes under Third Street (Fig. 3.16). PCBs in duplicate water samples taken at both locations were below the ORNL analytical detection limit of 0.0005 mg/L. Sediment and mud analyses indicated contamination of the creek by Cd, Cu, Zn, Hg, U-238, U-234, U-235, and several organics. None of the observed contamination appears to result from the two SWMUs in WAG 15 but rather represents releases that have occurred during other Y-12 Plant operations.

3.15.6 Regulatory Status of WAG 15

Before starting an RI plan for WAG 15, further surveys will be required to identify the potential for PCB release. As previously mentioned, all of the surplus transformers and capacitors have been removed and disposed. Thus, the major source of PCB-contaminated oil has been removed. However, the fact that one transformer is reported to have leaked oil indicates that some soil sampling is warranted. Because the 86-inch Cyclotron is no longer in use, the Z-oil inventory has been reduced. Once disposal of the remaining oil is completed, this source should be eliminated. A decision on the need for an RI plan for WAG 15 should be postponed pending further soil sampling and decontamination operations.

3.16. WAG 16—HEALTH PHYSICS RESEARCH AREA

3.16.1 Location and Description of WAG 16

WAG 16, the Health Physics Research Reactor (HPRR) Area [also known as the Dosimetry Applications Research (DOSAR) Facility] is located about 2 miles (3.2 km) south-southwest of the main ORNL plant area (Fig. 1.1). The HPRR consists of two buildings, one a combination laboratory-control building and the other the structure housing the unshielded reactor (Lundin 1965). WAG 16 includes two SWMUs: the cesium forest (16.1), and the HPRR retention pond (16.2) (Fig. 3.17).

The cesium forest is a small forest ecosystem contaminated with Cs-137. Thirty trees, ranging up to 100 ft (30 m) tall, were innoculated with Cs-137 to determine the movement of this nuclide and to act as an analog to the essential element, potassium. A total of 467 mCi (1.72×10^{10} Bq) of Cs-137 was introduced into the transpiration system of a number of yellow-poplar trees (Auerbach et al. 1964; Waller and Olson 1967). The site is a 66- by 82-ft (5,380 ft^2) plot [20- by 25-m plot (500 m^2)]. The site is just north of a patrol road leading from the HPRR to the TSF (WAG 14). The isotope was injected into the tree stems (trunks) over a three-day period (May 20–23, 1962). Since the isotope was injected, nearly 25 years has passed (~0.8 half-life); correcting for radiological decay, approximately 270 mCi (1.0×10^{10} Bq) remains. However, the amount on-site has probably been decreased even more by wind distribution of leaves, movement through soil, and runoff (Peters et al. 1969).

SWMU 16.2 is a retention pond installed to collect groundwater that may have entered the concrete lined pits in the reactor building that were used to store the reactor core (Lundin 1965). There are no records to indicate that the pond ever received any drainage from the storage pits or that any other liquids were added to the pond other than water discharged during testing of the fire protection sprinkler system. Some contamination in the pond might result from precipitation collecting in the pond.

3.16.2 Geologic Description of WAG 16

The formation underlying WAG 16 is described as gray, bedded, dolomitic limestone of the Knox Formation interbedded with conspicuous chert zones. The formation is about 2,625 ft (800 m) thick and without prominent faults in the vicinity of the site. The overlying soil is mainly silty clay, usually red but in some places yellow and interspersed with hard cherts of various sizes.

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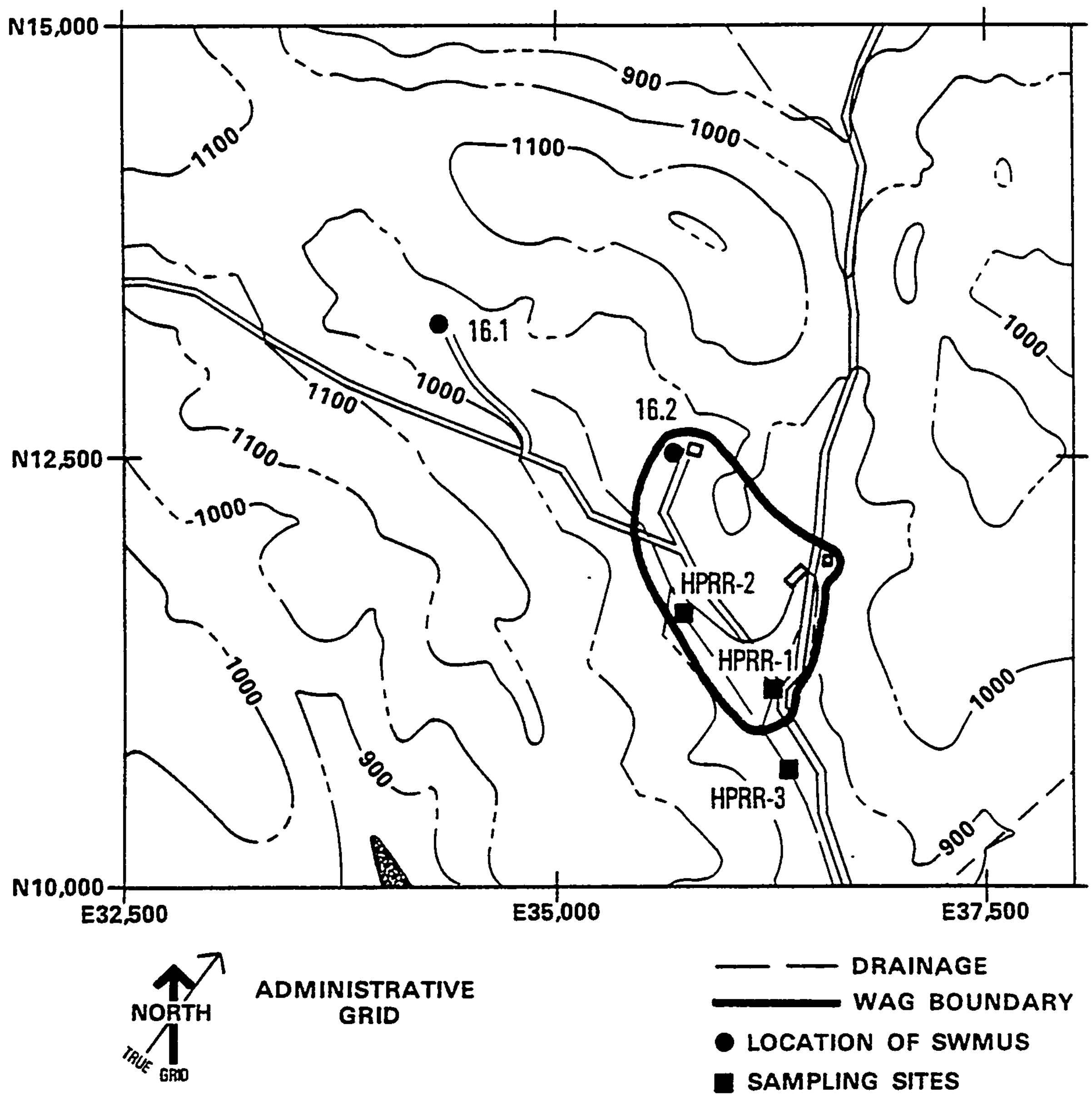

Fig. 3.17. WAG 16—Health Physics Research Reactor Area.

3.16.3 Hydrologic Description of WAG 16

Surface runoff at this site drains to two first-order stream channels, which are both intermittent. They combine to form a second-order channel that drains southeast into the Clinch River near mile 27 (km 43), above Melton Hill Dam. During August 1986, a flow of about 2 gal/min (7.6 L/min) was observed in the eastern-most tributary and came from the building that houses HPRR controls. No other flows were observed. Because of the similar physical setting, it is expected that this site will have hydrologic characteristics like those at Walker Branch Watershed, which have been described by Johnson and Van Hook (1986).

Groundwater flow has not been characterized at the site. It is presumed that conditions are similar to those at Walker Branch. In general, the depth to ground water at Walker Branch is at least 100 ft (30 m) near the ridge top, and this corresponds to the top of the bedrock. Sink holes appear on the topographic map for both Walker Branch and the HPRR site. It is expected that most groundwater flow occurs in weathered bedrock and that it is sustained during summer months by unsaturated drainage from the overlying residuum. During winter conditions, perched groundwater has been observed at a site on West Chestnut Ridge that is in a similar geologic setting overlying Knox dolomite (Elmore et al. 1985).

3.16.4 Known Releases from WAG 16

There have been no reported releases of contaminants (radioactive or hazardous chemicals) from either of the SWMUs in WAG 16. Research reports on the cesium forest (SWMU 16.1) indicate that some of the cesium injected into the trees has been translocated to the leaves of the trees, which have then fallen outside of the boundary of the forest. However, this is reported to be a fraction of the original activity injected. No groundwater or surface water sampling was performed as a part of the ecological studies on the forest.

3.16.5 Preliminary Survey Data for WAG 16

Samples of gravels were collected from three sites within WAG 16 by Morrison and Cerling (1987) (Fig. 3.17). Results for the gravels are given in Table 3.29 and show that Sr-90 and Cs-137 concentrations are near background; however, Co-60 was above background at one site (HPRR-3), but below background at the other two sites. Analysis for metals indicated that cadmium was

Table 3.29. Preliminary survey results for WAG 16

Element	BKGD	HPRR-1	HPRR-2	HPRR-3
		Gravels[a]		
Co-60[b]	<2	<7.2	<4	32±8
Sr-90[b]	<10	21.3±7.8	30	32±14
Cs-137[b]	3	<7	6.2	<7
Cd[c]	0.05	0.36	0.29	*d*
Cr[c]	0.9	*d*	*d*	*d*
Cu[c]	2.4	2.0±0.4	1.8	2.9
Ni[c]	5.6	*d*	*d*	4.2
Zn[c]	9	8.7±4.9	2.0	5.0
		Water (Bq/L)		
Co-60	<0.2	<0.3	*d*	*d*
Sr-90	<0.2	0.19	*d*	*d*
Cs-137	<0.2	<0.2	*d*	*d*
H-3	<30	110	*d*	*d*

[a]Concentrations reported on basis of dry weight of gravel sample. Radionuclides in Bq/kg. Metals in μg/g.
[b]Backgrounds estimated for counting procedure used in this study.
[c]Backgrounds estimated from several uncontaminated samples.
[d]Not detected.
Note: HPRR-1 (gravel, three samples; metals, three samples; water, one sample). HPRR-2 (one sample). HPRR-3 (one sample).
Source: Morrison and Cerling 1987.

detected but was reported by Morrison and Cerling to be more representative of the elevated cadmium content of the Knox Group rather than the presence of a contaminant. The single water sample taken (Site HPRR-1) showed no contamination from Co-60, Cs-137, or Sr-90; however, a tritium value slightly higher than the analytical detection limit [30 Bq/L (8.1×10^{-10} Ci/L)] was measured. A single mud sample from HPRR-1 showed no detectable concentrations of organics.

3.16.6 Regulatory Status of WAG 16

WAG 16 and its two SWMUs do not appear to be a source of release of radionuclides and hazardous chemicals. The preliminary survey confirmed that there was no evidence of past releases. Because the amount of radioactivity present in the cesium forest is small [calculated to be about 270 mCi (1.0×10^{10} Bq) maximum], and the ability of local soils to retain cesium is relatively high, it appears that any releases from this SWMU would be minor. No hazardous chemicals have been added to either of the SWMUs, and it is recommended that WAG 16 be deleted from further consideration as a RCRA Section 3004(u) site.

3.17 WAG 17—ORNL SERVICES AREA

3.17.1 Location and Description of WAG 17

WAG 17, the ORNL Services Area, is located about 1 mile (1.6 km) directly east of the ORNL Main Plant Area. WAG 17 is the major craft and machine shop area for ORNL. It includes the receiving and shipping departments, machine shops, carpenter shops, paint shops, lead-burning facilities, garage facilities, welding facilities, and material storage area required to support ORNL routine and experimental operations.

Eight SWMUs are included within the boundaries of WAG 17 (Fig. 3.18). Of these, one is a former septic tank now converted for use as a sewage pumping station clearwell for buildings in the area, five tanks are used for waste oil storage (one of which is mounted on a vehicle), and two tanks are used for storage of photographic wastes.

The septic tank–pumping station services rest rooms only and should not have had radioactive or hazardous chemical wastes added. In the case of the oil storage tanks (two are underground and three aboveground), one of the underground tanks (SWMU 17.2c) is known to contain radioactivity; the other tanks (above- and underground) collect waste oils from vehicle maintenance and cutting oils from machining operations. The two aboveground photographic waste tanks are used to store wastes prior to transport to the silver recovery unit (SWMU 8.10). No leaks or spills of oil or hazardous materials from any of the tanks have been reported. Most of the aboveground tanks are diked to contain leakage.

3.17.2 Geologic Description of WAG 17

WAG 17 is located in the same geologic setting as the main ORNL plant area (WAG 1). The underlying formation is the Chickamauga Limestone. This formation is reported by Stockdale (1951) to have the potential for containing solution channels and caverns.

3.17.3 Hydrologic Description of WAG 17

The major drainage from WAG 17 is to the west. This unnamed drainage flows into White Oak Creek about 200 ft (61 m) northwest of the security fence surrounding the ORNL Services Area.

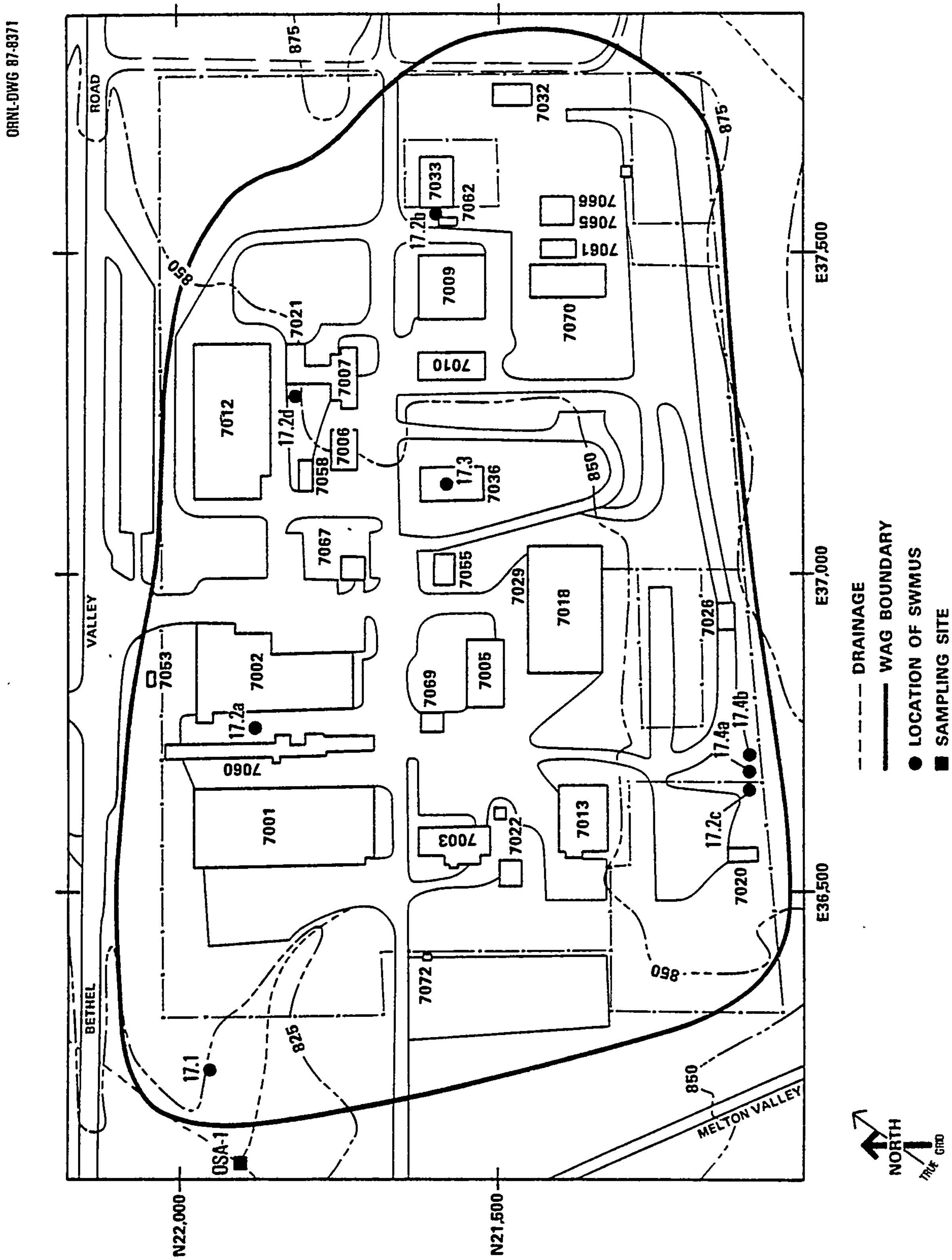

Fig. 3.18. WAG 17—ORNL Services Area.

3.17.4 Known Releases from WAG 17

There are no reports of releases of hazardous materials or radionuclides from WAG 17. However, because this area has been in use since ORNL operations began in 1943 some spills or leaks of waste oils and solvents have probably occurred but have not been documented.

3.17.5 Preliminary Survey Data for WAG 17

Morrison and Cerling (1987) established a sampling station on the unnamed drainageway from WAG 17 about 6.6 ft (2.0 m) upstream from its confluence with White Oak Creek (Fig. 3.18). At the time of sampling, flow in the drainage was about 3 gal/min (11 L/min). Samples of stream gravel, bank mud, and water were taken; also taken was about 100 cc of tar-covered pebbles.

Stream gravels had some of the highest Cd values found in the scoping survey (0.8 μg/g), and the concentrations of Zn, Cr, and Cu were above background (Table 3.29). Cobalt-60 and Sr-90 were at background levels whereas the Cs-137 concentration was elevated in one sample (triplicate samples); however, Cs-137, Co-60, Sr-90, and H-3 were below detection limits in the water samples (Table 3.30). This indicates that the radioactivity detected on the gravels probably was released at some time in the past, if indeed a release has occurred.

The mud samples indicated contamination by semivolatile organic compounds. The organics are visible as tarlike grain coatings in the stream. Elevated concentrations of 11 organic substances were detected in a gravel sample hand-picked to emphasize the tarlike coatings (Table 3.30).

Morrison and Cerling (1987) summarized their findings on WAG 17 by concluding that Cd and organic contamination exists at the site. Chromium, Cu, P, and Zn concentrations are also above the average values noted in the survey. No radionuclide contamination was observed, with the exception of one anomalous value for Cs-137. Contamination of WAG 17 probably results from hydrocarbons and detergent releases.

3.17.6 Regulatory Status of WAG 17

The scoping survey indicates that Cd and organic contamination exists at WAG 17. Although there was some indication from the gravel sampling that there may have been contamination by Cs-137, the water sample taken indicates radionuclides are below detection levels at this time.

Evidence indicates that WAG 17 will require the preparation of an RI plan and some form of remedial action. However, it is suggested that further sampling (using the stream gravel and water

Table 3.30. Preliminary survey results for WAG 17

Element	BKGD	OSA-1
		Gravels[a]
Co-60[b]	<2	<5
Sr-90[b]	<10	8.8±7.1
Cs-137[b]	3	30.5±38.5
Cd[c]	0.05	0.8±0.1
Cr[c]	0.9	2.6±0.2
Cu[c]	2.4	2.6±1.6
Ni[c]	5.6	*d*
Zn[c]	9	47±11
		Water (Bq/L)
Co-60	<0.2	<0.3
Sr-90	<0.2	0.1
Cs-137	<0.2	<0.3
H-3	<30	
		Tarry coating on gravel (μg/kg)
Di-n-butylphthalate		*d*
Phenanthrene		3,960
Anthracene		396
Fluoranthene		2,871
Pyrene		3,597
Benzo(a)anthracene		1,188
Chrysene		1,386
Benzo(b)fluoranthene		792
Benzo(k)fluoranthene		990
Benzo(a)pyrene		693
Indeno(1,2,3-cd)pyrene		792
Benzo(g,h,i)perilyne		792
Bis(2-ethylhexyl)phthalate		*d*
Butylbenzylphthalate		*d*

[a]Concentrations reported on basis of dry weight of gravel sample. Radionuclides in Bq/kg. Metals in μg/g.

[b]Backgrounds estimated for counting procedure used in this study.

[c]Backgrounds estimated from several uncontaminated samples.

[d]Not detected.

Note: Three samples for gravel, one sample for water. Black mud, one sample (no data). Gravel sample with black, tarry coatings (one sample; data are for this sample).

Source: Morrison and Cerling 1987.

sampling technique) be conducted to attempt to determine the source of the organic compounds and the Cd. At the present time, plans are being formulated to install hydrostatic head well clusters at the WAG boundary. Once these wells have been installed, it should be possible to locate monitoring wells and identify sources of contamination in WAG 17. The need for remedial action can be determined once additional sampling and analysis is conducted.

3.18 WAG 18—CONSOLIDATED FUEL REPROCESSING AREA

3.18.1 Location and Description of WAG 18

WAG 18, the Consolidated Fuel Reprocessing (CFR) Area, is located south of Bethel Valley Road, about 2.3 miles east of the main ORNL plant area (Fig. 1.1). Originally, this area was designated as the site of the Experimental Gas Cooled Reactor (EGCR) Project. This reactor was cancelled before operation but after most of the facilities were constructed, and the existing facilities were later converted for use by ORNL's CFR Division.

A total of nine SWMUs have been identified in WAG 18. SWMUs 18.1a and b are retention basins used to collect storm water runoff; SWMU 18.2 is a tank used to store paint solvents; SWMU 18.3 is the septic tank system used to handle domestic sewage produced at the CFR; SWMUs 18.4a–d are acidic process waste storage tanks; and SWMU 18.5 is an unused retention basin.

3.18.2 Geologic Description of WAG 18

WAG 18 is located in Melton Valley, which is underlain by units of the Conasauga Group of the middle and upper Cambrian Age. The more resistant rock layers of the Rome Formation, steeply inclined toward the southwest, are responsible for Haw Ridge, which parallels the valley immediately to the northwest. These layers dip beneath the shales of the Conasauga Group in Melton Valley. Thin layers and lenses of limestone are common but are generally irregular in distribution. There are no persistent limestone beds in the upper strata of the shale layers and, consequently, no underground solution channels or caverns.

Ten core holes drilled at WAG 18 as a part of preconstruction investigations of the EGCR verified that the site was underlain by dark red or maroon silty shale with numerous thin beds of fine- to medium-grained, light-gray, crystalline limestone, with no indication of solution channels.

3.18.3 Hydrologic Description of WAG 18

WAG 18 is located adjacent to Melton Hill Lake. Most of the site drainage is to the west-southwest toward Bearden Creek (Fig. 3.19). Some storm drainage is collected in two retention ponds on the northeast corner of the site. This water is released to Melton Hill Lake. No monitoring wells have been installed in the WAG 18 area; however, it is planned to install piezometers on the WAG boundary to determine direction and movement of groundwater.

3.18.4 Known Releases from WAG 18

There have been no reported releases of hazardous materials from any of the SWMUs located in WAG 18.

3.18.5 Preliminary Survey Data for WAG 18

WAG 18 drains west-southwest away from Melton Hill Lake and into Bearden Creek (Fig. 3.19). Sampling site CFR-1 extends from 3.3 to 66 ft (1 to 20 m) downstream from a small holding pond on the west side of the paved entrance road to the CFR area. Gravel, dark mud, and water samples were taken at sampling Site CFR-1.

Cobalt-60, Sr-90, and Cs-137 are at background concentrations in the stream gravel and water samples. No metals other than Zn and Cu were detected, and these are about at background concentrations (Table 3.31). No semivolatile organics were detected in a single sample of black mud. In summary, Morrison and Cerling (1987) reported that no contamination was observed at WAG 18, with the possible exception of Zn.

3.18.6 Regulatory Status of WAG 18

Based on available information and the results obtained in the scoping studies, there does not appear to be evidence of past releases of hazardous materials from WAG 18. Because current operations do not involve greater than trace amounts of radionuclides, it appears that WAG 18 will not require the preparation of an RI plan for remedial action under Section 3004(u).

The only SWMUs in WAG 18 that involve hazardous wastes are the waste acid storage tanks (both stationary and mobile) and the paint solvent storage tank. These tanks are included in ORNL's tank inventory program and are inspected on a regular basis.

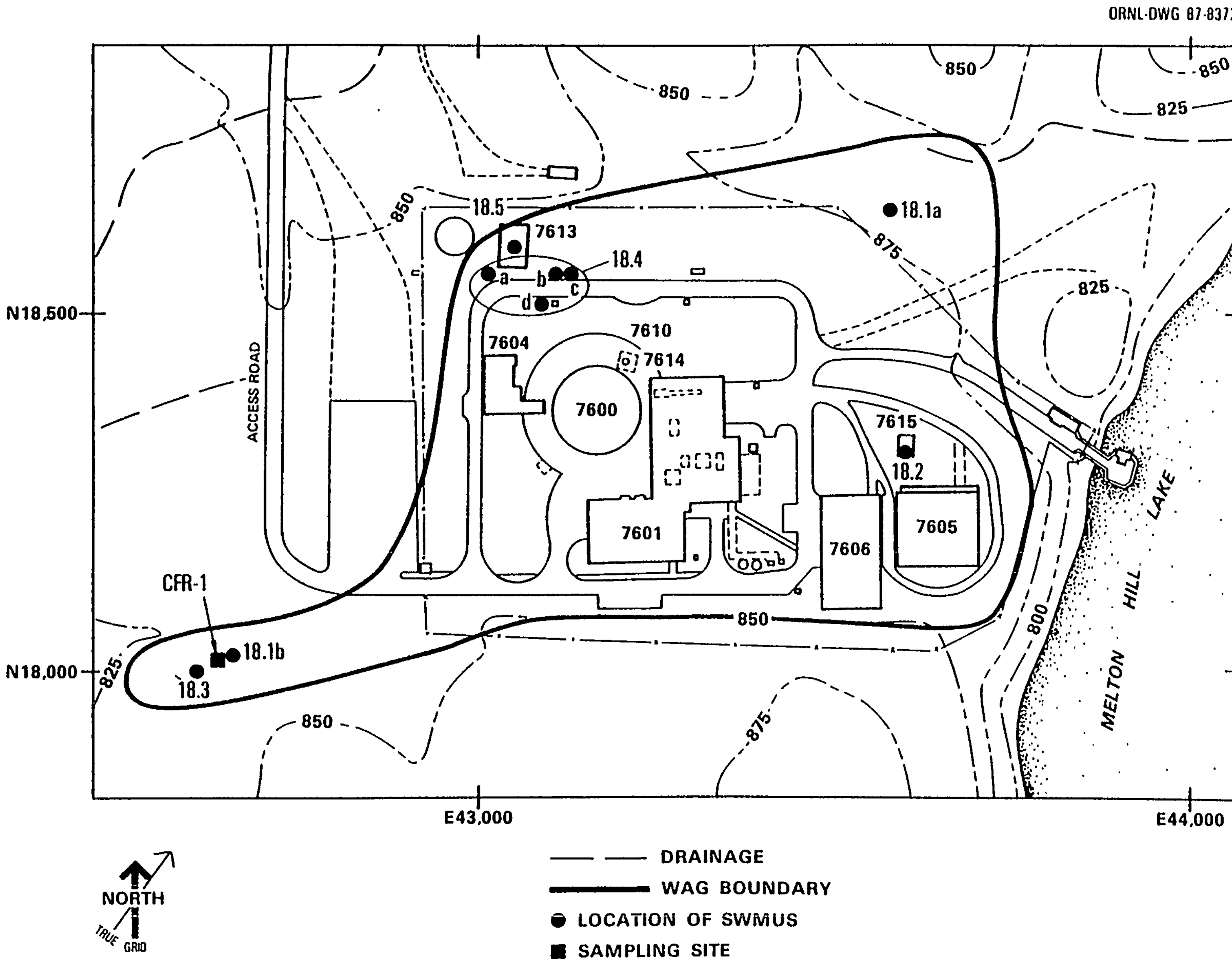

Fig. 3.19. WAG 18—Consolidated Fuel Reprocessing Area.

Table 3.31. Preliminary survey results for WAG 18

Element	BKGD	CFR-1
	Gravels[a]	
Co-60[b]	<12	<7
Sr-90[b]	<10	14.4±7.9
Cs-137[b]	3	<7
Cd[c]	0.05	*d*
Cr[c]	0.9	*d*
Cu[c]	2.4	2.2±1.3
Ni[c]	5.6	*d*
Zn[c]	9	23±11
	Water (Bq/L)	
Co-60	<0.2	<0.2
Sr-90	<0.2	<0.1
Cs-137	<0.2	<0.3
H-3	<30	

[a]Concentrations reported on basis of dry weight of gravel sample. Radionuclides in Bq/kg. Metals in $\mu g/g$.
[b]Backgrounds estimated for counting procedure used in this study.
[c]Backgrounds estimated from several uncontaminated samples.
[d]Not detected.
Note: Gravels (three samples), water (one sample), muds (one sample).
Source: Morrison and Cerling 1987.

3.19 WAG 19—HAZARDOUS WASTE TREATMENT AND STORAGE FACILITIES

3.19.1 Location and Description of WAG 19

WAG 19 is located southeast of the ORNL main plant area (Fig. 1.1). Contained in WAG 19 are the six SWMUs that represent ORNL's hazardous waste treatment and storage facilities. Also included in this WAG is the new facility that has recently been permitted for the storage of hazardous wastes (SWMU 19.1). Permitting this facility initiated the investigations that are the basis for this report.

Figure 3.20 shows the locations of the SWMUs in WAG 19. This WAG contains two separate clusters of SWMUs: the first cluster includes the permitted hazardous and mixed waste storage units (SWMUs 19.1, 19.2, 19.3, and 19.4), and the second cluster includes two interim status SWMUs that treat and/or dispose of reactive or gaseous hazardous wastes (i.e., SWMUs 19.5 and 19.6). For purposes of defining the WAG boundaries, it did not appear necessary to connect the

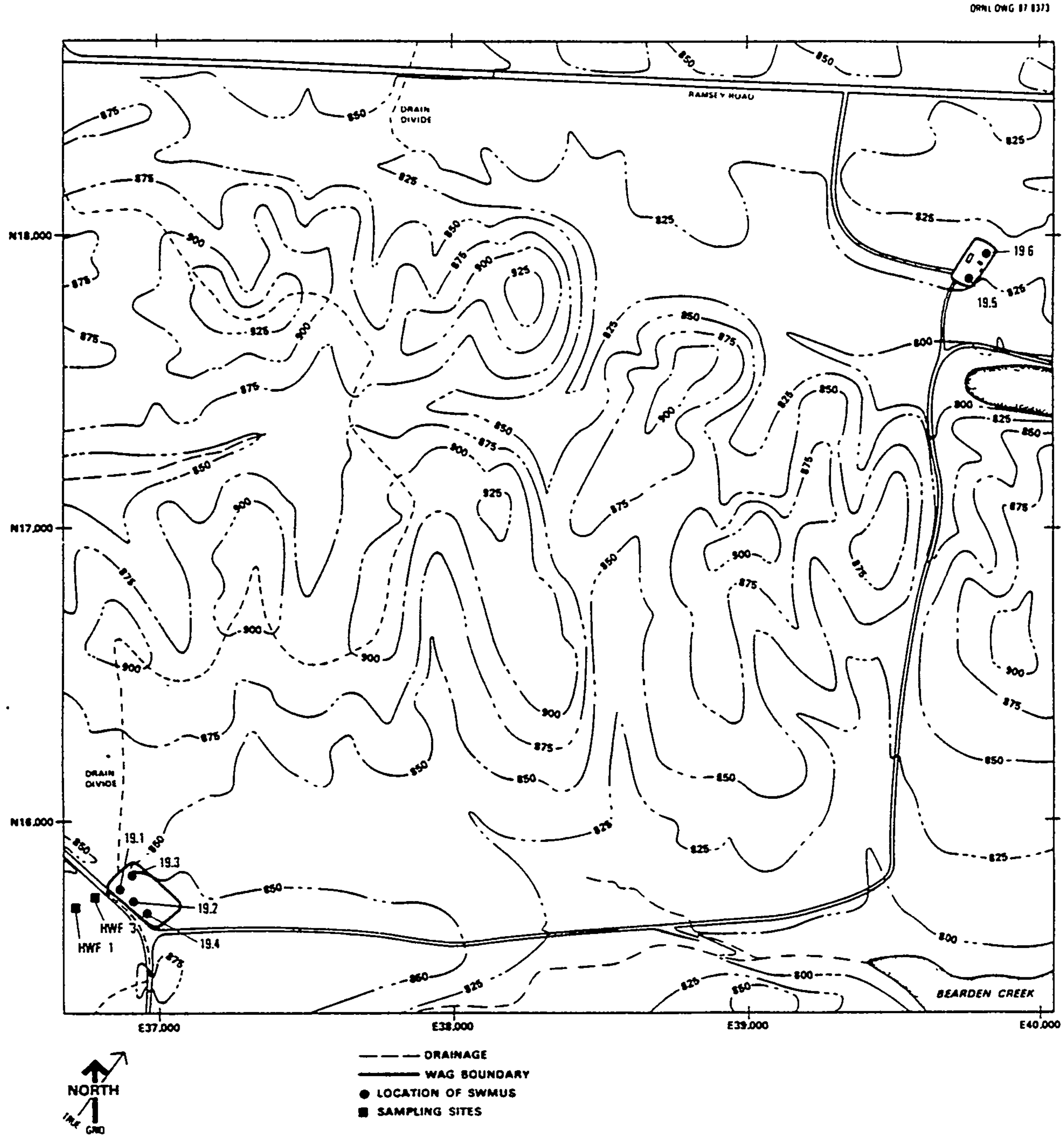

Fig. 3.20. WAG 19—Hazardous Waste Treatment and Storage Facilities.

two clusters because the geohydrologic setting was not exactly the same, and the functions performed within the clusters were different. Also, because no other SWMUs exist in the immediate area the two separate clusters are handled as one WAG rather than two WAGs. All of the SWMUs in WAG 19 have been permitted by TDHE or are operated under interim status.

3.19.2 Geologic Description of WAG 19

WAG 19 is located in Melton Valley east of WAGs 5 and 8. The Valley lies within the Copper Creek fault block and is underlain by strata of the middle to late Cambrian Conasauga Group.

3.19.3 Hydrologic Description of WAG 19

Surface drainage from the cluster of hazardous waste storage facilities (SWMUs 19.1, 19.2, 19.3, and 19.4) flows to the southwest into a roadside ditch then to the northwest along the road (which it crosses) and finally enters a well-defined stream channel (Fig. 3.20). Drainage from the second site in WAG 19 flows southeast in a small channel and finally enters Bearden Creek (an arm of Melton Hill Lake). No information has been published on groundwater movement in the area.

3.19.4 Known Releases from WAG 19

There are no recorded spills or leaks at any of the sites in WAG 19. All of the facilities have been designed to contain any spills or leaks that occur in the waste containers handled or stored.

3.19.5 Preliminary Survey Data for WAG 19

Sampling stations HWF-1, HWF-2, and HWF-3 were established along the stream channel on the other side of the road next to the Hazardous Waste Storage Area. Drainage from the other site flows southeast in a small channel and enters Bearden Creek. One sampling station was located along this small channel. No water was flowing in the stream channels at any of the sites at the time samples were taken, and as a result, only stream gravels and sediments were sampled.

Most of the metals were below detection limits; nickel was detectable but at background concentrations (Table 3.32). As mentioned previously for WAG 11, the Ni concentrations likely represent lithologic variation in the stream gravels. Co-60, Sr-90, and Cs-137 are at background concentrations in the stream gravels. No organic analyses were performed.

Table 3.32. Preliminary survey results for WAG 19

Element	BKGD	HFW-1	HFW-2	HFW-3
		Gravels[a]		
Co-60[b]	<2	<6	<4	<8
Sr-90[b]	<10	11	6.9	8.3
Cs-137[b]	3	<7	<5	9.8
Cd[c]	0.05	*d*	*d*	*d*
Cr[c]	0.9	*d*	*d*	*d*
Cu[c]	2.4	*d*	1.3	*d*
Ni[c]	5.6	3.5	5.5	5.2
Zn[c]	9	*d*	*d*	*d*
		Water (Bq/L)		
Co-60	<0.2	*d*	*d*	*d*
Sr-90	<0.2	*d*	*d*	*d*
Cs-137	<0.2	*d*	*d*	*d*
H-3	<30	*d*	*d*	*d*

[a]Concentrations reported on basis of dry weight of gravel sample. Radionuclides in Bq/kg. Metals in $\mu g/g$.
[b]Backgrounds estimated for counting procedure used in this study.
[c]Backgrounds estimated from several uncontaminated samples.
[d]Not detected.
Note: All sites (one sample).
Source: Morrison and Cerling 1987.

Based on the results of the survey, no contamination has occurred in WAG 19 as a result of the operation of the SWMUs identified in Phase I. However, additional samples may be required to identify if organic contaminants are present in the drainage.

3.19.6 Regulatory Status of WAG 19

No release of hazardous materials (chemical or radionuclide) has been reported for any of the SWMUs in WAG 19. Preliminary surveys appear to suggest that no releases of hazardous metals have occurred. It appears that this WAG (and its associated SWMUs) could be removed from the list of sites to be covered in future remedial investigations; however, it is suggested that additional sampling for organic contaminants be conducted before making a final determination of status.

3.20 WAG 20—Oak Ridge Land Farm

3.20.1 Location and Description of WAG 20

WAG 20 includes the Sewage Sludge Land Farm for the city of Oak Ridge. There is only one SWMU in WAG 20. The site is located on the southeast side of Chestnut Ridge and north of Bethel Valley Road, about 5 miles (8 km) east of the ORNL main plant area (Fig. 3.21). The site is bounded on the west by Mount Vernon Road.

Sludge spreading at the site was initiated in November 1983; however, in March 1984 it was learned that some of the deposited sludge had been contaminated with various radionuclides, primarily Cs-137 and Co-60. As a result, for a short period of time the disposal operation was halted until the source of the contamination could be eliminated. Disposal of sludge at the site is currently in progress, and it is estimated that over 6M gal (2.27×10^7 L) has been applied. The site contains 65 acres (26 ha).

3.20.2 Geologic Description of WAG 20

The Land Farm site is on the southeast side of Chestnut Ridge. The land surface is hilly with moderate slopes. The site is underlain by carbonate rocks of the Chickamauga Formation (mainly gray to blue-gray argillaceous or shaley limestone). Some beds of relatively pure limestone may occur in addition to interbedded calcareous shales of varying thickness. Chert occurs sparsely in the Chickamauga Limestone. Strata in the area dip southeastward at about 25° to 35° although dips may vary considerably in some areas due to small local structures or faults. Intense jointing has occurred in the area as attested by the presence of sinks and depressions and the strongly dissected land surface; the joints are probably related to the Copper Creek fault, which is southeast of the site.

Chickamauga soils are thinner than those developed from the Knox Group and may be brown to reddish-brown to yellowish in color. The soils may contain limestone fragments, particularly in horizons close to the soil-bedrock interface. The Chickamauga soils are mostly Collegedale and Sequoia associations, but some areas may have Leadville and Armuchee soil.

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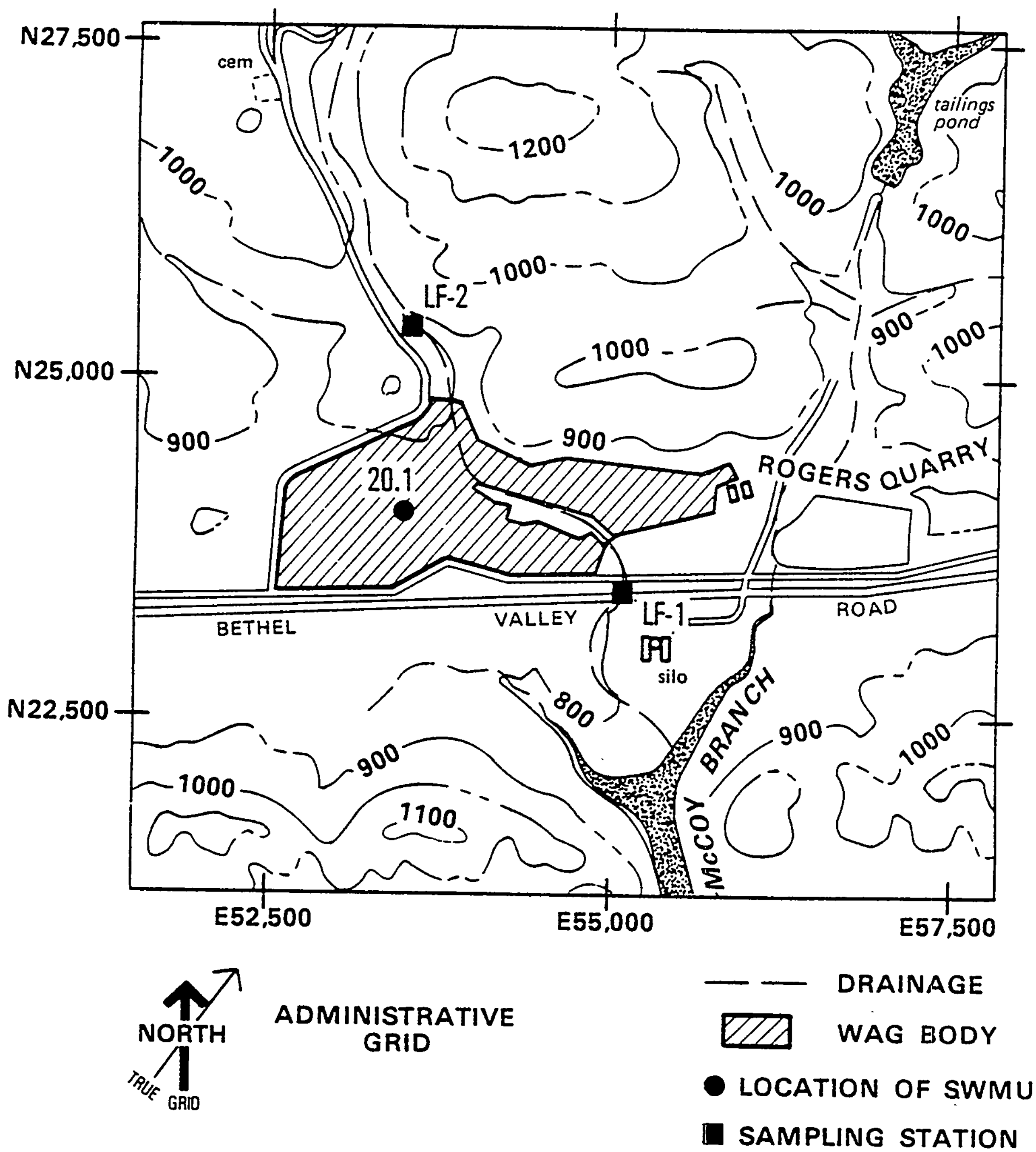

Fig. 3.21. WAG 20—Oak Ridge Land Farm.

3.20.3 Hydrologic Description of WAG 20

Direction of the surface drainage is variable; however, the site drains southeast into Melton Hill Lake (reservoir) about 1 mile (1.6 km) from WAG 20. Groundwater occurs and moves mainly within a system of solution-enlarged joints in the carbonate bedrock. Groundwater movement is probably southeast toward the Clinch River (Melton Hill Lake), but such flow may be either northeast or southwest to deep drainages that cut through Haw Ridge and the Copper Creek fault. One spring occurs just to the northwest of WAG 20; this spring is hydrologically upgradient and is not subject to contamination by the Land Farm.

3.20.4 Known Releases from WAG 19

In granting approval for operation of the Land Farm, TDHE restricted application rates in order to control nitrogen application rates. It specified application of sludge at a rate of no more than 6.24 tons/acre. In 1984 it was learned that some of the deposited sludge had been contaminated with various radionuclides, primarily Co-60 and Cs-137 (Oakes et al. 1984a, 1984b). A comprehensive program followed by a pathways analysis was conducted. The results of the analysis indicate that the yearly dose commitment to the total body would be 1.1 mrem/year from the landfill.

3.20.5 Preliminary Survey Data for WAG 20

In the fall of 1986, Morrison and Cerling (1987) conducted a scoping survey at WAG 20. Location of sampling points is shown in Fig. 3.21. One sampling point is located above the Land Farm, and the second is located where an unnamed stream (which passes through the Land Farm) crosses Bethel Valley Road. Samples of mud and water were taken from each site. Samples analyzed showed that no contamination was observed coming from WAG 20. A relatively high Ni concentration (15.1 $\mu g/g$, about three times background) was observed in one sample; however, two other samples at the same site were below the detection limit. This may be due to lithologic variation in the gravels sampled (Table 3.33).

Table 3.33. Preliminary survey results for WAG 20

Element	BKGD	LF-1	LF-2
		Gravels[a]	
Co-60[b]	<2	<9	*d*
Sr-90[b]	<10	10	*d*
Cs-137[b]	3	<6	*d*
Cd[c]	0.05	*d*	*d*
Cr[c]	0.9	*d*	*d*
Cu[c]	2.4	*d*	*d*
Ni[c]	5.6	15.1[c]	*d*
Zn[c]	9	3 ± 1	4
		Water (Bq/L)	
Co-60[e]	<0.2	<0.4	*d*
Sr-90[e]	<0.2	<0.2	*d*
Cs-137[e]	<0.2	0.4	*d*

[a]Concentrations reported on basis of dry weight of gravel sample. Radionuclides in Bq/kg. Metals in $\mu g/g$.

[b]Backgrounds estimated for counting procedure used in this study.

[c]Backgrounds estimated from several uncontaminated samples.

[d]Not detected.

[e]One sample had 15.1 $\mu g/g$. Two samples were below detection.

Note: LF-1 (gravel, one sample; metals, three samples; water, one sample; organics, two samples). LF-2 (metals, one sample; organics, one sample).

Source: Morrison and Cerling 1987.

3.20.6 Regulatory Status of WAG 20

Based on the results of the earlier data collected as a part of the 1984 pathways analysis (Oakes et al. 1984b) and the preliminary survey (Sect. 3.20.5), WAG 20 does not appear to represent a source of release of hazardous constituents. Although the sewage sludge applied in past operations contained trace amounts of radioactivity and heavy metals, sampling does not indicate that these materials are being released in significant quantities. This facility is operated as a land disposal site by the city of Oak Ridge with the approval of TDHE and is subject to regulation under the Clean Water Act. ORNL does not feel that additional remedial action studies are justified for this WAG and recommends that it be removed from further Section 3004(u) remedial action consideration.

4. SUMMARY OF THE STATUS OF THE WAGs

4.1 INVENTORY OF MAJOR CONTAMINANTS AND REGULATORY STATUS

Part 2 of this report contains the summary sheets providing background information for each of the SWMUs that have been identified by ORNL as potential Section 3004(u) sites. Also included in Part 2 are the 29 sites managed under DOE Surplus Facilities Management programs (which are not SWMUs) that also will undergo remedial action (decommissioning) under DOE regulatory programs. In many cases, the nature and/or the amount of the contaminants present is not known. For SWMUs having unreported inventories, estimates have been made of inventories of major contaminants using the best information available at this time. Table 4.1 summarizes the contaminants and inventories.

Also included in Table 4.1 is ORNL's judgment regarding the regulatory program under which each SWMU might be handled. It should be noted that in preparing the original SWMU list (Table 1.1) ORNL included *all* waste handling units (as defined by EPA as potential SWMUs) regardless of whether a release has occurred or not. As a result, the list of SWMUs (Table 1.1) includes some sites that probably should not receive further evaluation under Section 3004(u) and could be eliminated from the list. Examples of such SWMUs are septic tanks, the LLW tanks that are still in service (permitted by rule), RCRA-permitted hazardous waste treatment and storage facilities, and waste oil and acid tanks. These SWMUs have not produced releases and as a result should not be considered as Section 3004(u) sites.

Using the information available regarding the presence or absence of releases from each WAG (see Sect. 3 and Table 4.1), Table 4.2 has been developed that summarizes the ORNL recommendations concerning the need for additional remedial action for each of the 20 WAGs. SWMUs are also identified in Table 4.2 that ORNL suggests be removed from ongoing Section 3004(u) evaluations, either because they have no recorded releases, do not appear to present the potential for release, or are currently covered by existing regulatory guidance.

Table 4.1. Inventories of major contaminants and regulatory status[a]

Site	Contaminant	Inventory[b] [Ci (kg)]	RCRA		DOE Orders	
			Permit	Sect. 3004 (u)	5480.14	5820.2
1.0 Main Plant Area						
1.1 Mercury Contaminated Soil (3503)	Hg	(<1.0 est.)		X		
1.2 (3592)	Hg	(≤1.4 × 10^3)		X		
1.3 (4501)	Hg	(<10 est.)		X		
1.4 (4508)	Hg	Presence unconfirmed		X		
1.5a–w LLW Lines and Leak Sites	Sr-90, Cs-137, TRU, Hz	Unknown		X[c]	X	
1.6 Contaminated Surfaces and Soil from 1959 Explosion in Bldg. 3019 Cell	Pu-239	<4.7 × 10^2			X	
1.7 Contamination at Base of 3019 Stack	Unidentified	Presence unconfirmed			X	
1.8 Graphite Reactor Storage Canal Overflow (3001/3019)	Unidentified	Presence unconfirmed		X	X	
1.9 ORR Decay Tank Rupture Site (3087)	Neutron activation products	Presence unconfirmed		X	X	
1.10 Storage Pads (3503, 3504)	U-233, Pu-239	<1.0 × 10^{-1} est.		X		X
1.11 Decommissioned Waste Holding Basin (3512)	Unidentifed	<1.0 × 10^1 est.		X	X	
1.12 Waste Holding Basin (3513)	Sr-90 Cs-137 Pu-239	3.0 × 10^1 2.0 × 10^2 5.0		X		X
1.13 Equalization Basin (3524)	Sr-90 Cs-137 Th, U, TRU	3.0 × 10^1 1.0 × 10^2 1.1 × 10^1	X[d]	X		
1.14 Process Waste Pond (3539)	Unidentified	<1.0 × 10^1 est.	X[d]	X		
1.15 Process Waste Pond (3540)	Unidentified	<1.0 × 10^1 est.	X[d]	X		
1.16 Sewage Aeration Pond (East)—(2543)	Unidentified	<1.0 × 10^1 est.		X		

Table 4.1 (continued)

Site	Contaminant	Inventory[b] [Ci (kg)]	RCRA		DOE Orders	
			Permit	Sect. 3004 (u)	5480.14	5820.2
1.17 West Sewage Pond (2544)	Unidentified	$<1.0 \times 10^{1}$ est.		X		
1.18 Coal Pile Settling Basin (2545)	Unidentified	Unknown		X		
1.19 LITR Pond (3085W)	Sr-90, Cs-137	$<20 \times 10^{-3}$ est.				
1.20 3517 Filter Pit	Sr-90, Cs-137	Unknown		X		X
1.21 LLW Transfer Line	Unidentified	$<1.0 \times 10^{3}$ est.		X		X
1.22 Isotopes Ductwork/ 3110 Filter House	Unidentified	Unknown		X		X
1.23 Inactive Tanks (W-1)	Sr-90	9.0×10^{-2}	X	X		X
	Cs-137	2.0×10^{-2}				
	TRU	7.0×10^{-4}				
W-2	Sr-90	1.0×10^{1}	X	X		X
	Cs-137	1.0×10^{1}				
	TRU	7.0				
1.24 Inactive Tanks (W-3)	Sr-90	$<1.0 \times 10^{2}$ est.	X	X		X
	Cs-137	$<1.0 \times 10^{3}$ est.				
	TRU	$<1.0 \times 10^{2}$ est.				
(W-4)	Sr-90	1.0×10^{2}	X	X		X
	Cs-137	1.0×10^{2}				
	TRU	4.2				
1.25 Inactive Tanks (W-13)	Sr-90	3.0×10^{2}	X	X		X
	Cs-137	3.0×10^{1}				
	TRU	4.3×10^{-2}				
(W-14)	Sr-90	8.0	X	X		
	Cs-137	6.0				
	TRU	6.0×10^{-4}				
(W-15)	Unidentified	Unknown	X	X		X
1.26 Inactive Tanks (W-5, W-6, W-7, W-8, W-9, W-10)	Sr-90	1.9×10^{4}	X	X		X
	Cs-137	2.5×10^{3}				
	Th-232	($<1.0 \times 10^{4}$ est.)				
	U-238	($<1.0 \times 10^{4}$ est.)				
	TRU	$<1.0 \times 10^{2}$ est.				

Table 4.1 (continued)

Site	Contaminant	Inventory[b] [Ci (kg)]	RCRA Permit	RCRA Sect. 3004 (u)	DOE Orders 5480.14	DOE Orders 5820.2
1.27 Inactive Tank (W-11)	Sr-90 Cs-137 TRU	$<1.0 \times 10^{-3}$ est. $<1.0 \times 10^{-3}$ est. $<1.0 \times 10^{-3}$ est.	X	X		X
1.28 Inactive Tank (W-1A)	Sr-90, Cs-137, U-233, TRU	Unknown	X	X		X
1.29 Inactive Tank (WC-1)	Sr-90 Cs-137 TRU	$<1.0 \times 10^{1}$ est. $<1.0 \times 10^{1}$ est. $<1.0 \times 10^{-1}$ est.	X	X		X
1.30 Inactive Tanks (WC-15)	Sr-90, Cs-137, TRU	$<1.0 \times 10^{-1}$ est.	X	X		X
(WC-17)	Sr-90 Cs-137 TRU	2.2×10^{-3} 5.2×10^{-4} 1.2×10^{-3}	X	X		X
1.31 Inactive Tanks (TH-1)	Sr-90 Cs-137 TRU	6.0×10^{-1} 5.0×10^{-1} 2.0×10^{-4}	X	X		X
(TH-2)	Sr-90, Cs-137, TRU	Unknown	X	X		X
(TH-3)	Sr-90 Cs-137 TRU	6.0×10^{-1} 6.0×10^{-1} 2.0×10^{-4}	X	X		X
1.32 Inactive Tank (TH-4)	Sr-90 Cs-137 TRU	6.0×10^{-2} 5.0×10^{-1} 8.5×10^{-2}	X	X		X
1.33 Active Tank (2026)	Unidentified	Unknown	X	X		
1.34 Active Tank (WC-2)	Unidentified	Unknown	X	X		
1.35 Active Tank (WC-3)	Unidentified	Unknown	X	X		
1.36 Inactive Tank (WC-4)	Unidentified	Unknown	X	X		
1.37 Active Tanks (WC-5, WC-6, WC-8, WC-9)	Unidentified	Unknown	X	X		
1.38 Active Tank (WC-7)	Unidentified	Unknown	X	X		
1.39 Active Tanks (WC-10, WC-11, WC-12, WC-13, WC-14)	Unidentified	Unknown	X	X		

Table 4.1 (continued)

Site	Contaminant	Inventory[b] [Ci (kg)]	RCRA		DOE Orders	
			Permit	Sect. 3004 (u)	5480.14	5820.2
1.40 Active Tank (WC-19)	Unidentified	Unknown	X	X		
1.41 Active Tank (W-12)	Unidentified	Unknown	X	X		
1.42 Active Tanks (W-16, W-17, W-18)	Unidentified	Unknown	X	X		
1.43 Active Tanks (W-21, W-22)	Unidentified	Unknown	X	X		
1.44 Active Tank (W-23)	Unidentified	Unknown	X	X		
1.45 Active Tanks (C-1, C-2)	Unidentified	Unknown	X	X		
1.46 SWSA-1 (2624)	Sr-90, unidentified Hz	$<4.0 \times 10^3$ Unknown		X	X	
1.47 SWSA-2 (4003)	Unidentified	Presence unconfirmed Contents moved to SWSA-3 before 1950		X	X	
1.48 LLW Evaporator (2531)	Unidentified	Unknown	X	X		
1.49 Neutralization Facility (3518)	Unidentified	Unknown	X	X		
1.50 PCB Storage Area (2018N)	Unidentified	Unknown		X[e]		
1.51 PWTP (3544)	Unidentified	Unknown	X	X		
1.52 Sewage Treatment Plant (2521)	Unidentified	Unknown		X		
1.53 Bldg. 3000 Septic Tank (3078)	Unidentified	Unknown		X		
1.54 Waste Oil Storage Tanks (2525)	Unidentified	Unknown	X	X		
2.0 White Oak Creek and White Oak Lake						
2.1 WOL and Embayment	Sr-90 Cs-137 Th, U, TRU Pu-239 Cr Pb	2.0×10^1 5.9×10^2 $<1.0 \times 10^1$ <1.0 est. ($\leq 2.0 \times 10^4$ est.) ($\leq 2.0 \times 10^3$ est.)		X	X	
2.2 WOC and Tributaries	Sr-90 Cs-137 Pu-239 Hz	>5.0 est. $>1.0 \times 10^2$ est. $>5.0 \times 10^{-1}$ est. Unknown		X	X	
3.0 Solid Waste Disposal Area 3						
3.1 SWSA-3 (1001)	H-3, Sr-90, unidentified Hz	$<5.6 \times 10^4$ Unknown		X	X	

Table 4.1 (continued)

Site	Contaminant	Inventory[b] [Ci (kg)]	RCRA Permit	RCRA Sect. 3004 (u)	DOE Orders 5480.14	DOE Orders 5820.2
3.2 Closed Scrap Metal Area (1562)	Unidentified	Unknown		X	X	
3.3 Contractors' Landfill (1554)	Unidentified	Unknown		X		
4.0 Solid Waste Disposal Area 4						
4.1 LLW Line	Unidentified	Unknown		X	X	
4.2 Pilot Pits 1 and 2	None	None		X	X	
4.3 SWSA-4	H-3; Co-60; Sr-90; Cs-137; Th, U, TRU; unidentified	$<1.2 \times 10^5$		X	X	
	Hz	Unknown				
5.0 Solid Waste Disposal Area 5						
5.1 LLW Lines and Leak Sites	Unidentified	$<1.0 \times 10^3$ est.		X	X	
5.2 OHF Pond (7852A)	Sr-90	2.0×10^1		X		X
	Cs-137	$<3.9 \times 10^2$				
	TRU	$<5.0 \times 10^{-2}$				
5.3 OHF Surface Facilities	Sr-90, Cs-137, TRU	$<1.0 \times 10^3$ est.		X		X
5.4 NHF Surface Facilities	Unidentified	Unknown		X		X
5.5 OHF Tanks	Sr-90, Cs-137, TRU	4.6×10^3 est.	X	X		X
	Hz	Unknown				
5.6 Process Waste Sludge Basin (7835)	Unidentified	$<5.0 \times 10^1$		X	X	
5.7 SWSA-5	H-3; Co-60; Sr-90; Cs-137; Th, U, TRU; unidentified	$<2.1 \times 10^5$		X	X	
	Hz	Unknown				
5.8 LLW Concentrate Tanks (W-24–W-31)	Sr-90	3.0×10^4	X	X		
	Cs-137	1.0×10^3				
	Th-232	($<1.0 \times 10^4$ est.)				
	U-238	($<1.0 \times 10^4$ est.)				
	TRU	1.9×10^2				
	Hz	Unknown				
5.9 Waste Oil Tank (7860A)	Unidentified	1.1×10^{-2}		X		X

Table 4.1 (continued)

Site	Contaminant	Inventory[b] [Ci (kg)]	RCRA		DOE Orders	
			Permit	Sect. 3004 (u)	5480.14	5820.2
5.10 TRU Waste Storage Area	TRU	Unknown				X
6.0 Solid Waste Disposal Area 6						
6.1 SWSA-6 (7822)	Unidentified	$<4.8 \times 10^4$	X	X		X
	H-3	$<7.1 \times 10^3$				
	Co-60	$<3.2 \times 10^4$				
	Sr-90	$<3.0 \times 10^3$				
	Cs-137	$<5.1 \times 10^3$				
	Eu-152	$<5.1 \times 10^4$				
	Eu-154	$<7.3 \times 10^4$				
	Eu-155	$<3.1 \times 10^4$				
	Th-232	<2.5 (2.3×10^4)				
	U-233	$<2.3 \times 10^2$				
	U-238	$<2.1 \times 10^2$ (6.1×10^5)				
	TRU	<3.6				
	Asbestos	Unknown				
	Pb	$(>6.8 \times 10^4)$				
	Solvents	$(>4.3 \times 10^4)$				
6.2 Emergency Waste Basin (7821)	None	None		X	X	
6.3 Explosives Detonation Trench (7822A)	None	None	X	X		
7.0 LLW Pits and Trenches						
7.1 Decontamination Facility (7819)	Unidentified	<1.0 est.		X		X
7.2 HRE Fuel Wells (7809)	Sr-90	$<2.0 \times 10^1$		X	X	
	U-235	8.5×10^{-3} (4.0)				
	U-238	2.0×10^{-4} (6.5×10^{-1})				
7.3 HF Soil Contamination	Cs-137, unidentified	$<1.0 \times 10^1$ est.		X	X	

Table 4.1 (continued)

Site	Contaminant	Inventory[b] [Ci (kg)]	RCRA Permit	RCRA Sect. 3004 (u)	DOE Orders 5480.14	DOE Orders 5820.2
7.4 LLW Lines and Leak Sites	Sr-90, Cs-137, TRU, Cm-244	<1.0 × 10^3 est.		X	X	
7.5 Pit 1 (7805)	Cs-137	2.3 × 10^2		X	X	
	Pu-239	2.1 × 10^{-2}				
7.6 Pits 2, 3, and 4	Sr-90	4.2 × 10^4		X	X	
	Cs-137	1.8 × 10^5				
	Pu-239	2.9 × 10^1				
7.7 Trench 5 (7809)	Sr-90	<9.7 × 10^4		X	X	
	Cs-137	2.1 × 10^5				
	Pu-239	1.0 × 10^1				
7.8 Trench 6 (7810)	Sr-90	1.5 × 10^2		X	X	
	Cs-137	6.7 × 10^2				
	Pu-239	1.3 × 10^{-2}				
7.9 Trench 7 (7818)	Sr-90	4.8 × 10^4		X	X	
	Cs-137	2.3 × 10^5				
	U-233	3.2				
	U-238	4.0 × 10^{-2} (1.2 × 10^2)				
	Pu-239	1.2 × 10^1				
	TRU	3.9 × 10^1				
7.10 Shielded Transfer Tanks	Cs-137	<2.0 × 10^3 est.				X
8.0 Melton Valley Area						
8.1 HFIR/TRU Ponds	Co-60, Cm-244, TRU	<1.0 × 10^1 est.	X[d]	X		
8.2 HF-S2A	Unidentified	<1.0 est.		X	X	
8.3 LLW Lines and Leak Sites	Cm-244, unidentified	Unknown		X	X	
8.4 Hazardous Waste Storage Facility (7507)	Unidentified	Unknown	X	X		
8.5 Active LLW Tank (WC-20)	Unidentified	Unknown	X	X		
8.6 Active LLW Tank (HFIR)	Unidentified	Unknown	X	X		

Table 4.1 (continued)

Site	Contaminant	Inventory[b] [Ci (kg)]	RCRA Permit	RCRA Sect. 3004 (u)	DOE Orders 5480.14	DOE Orders 5820.2
8.7 Active LLW Tanks (T-1, T-2)	Unidentified	Unknown	X	X		
8.8 Mixed Waste Storage Pad (7507W)	Unidentified	Unknown	X	X		
8.9 Sewage Treatment Plant (7904)	Unidentified	Unknown		X		
8.10 Silver Recovery Process (7834)	Unidentified	Unknown	X	X		
9.0 HRE Area						
9.1 HRE Pond	Sr-90	7.5×10^1		X		X
	Cs-137	1.6×10^1				
	TRU	5.0×10^{-4}				
9.2 LLW Tanks	Sr-90, Cs-137, U	Unknown	X	X		X
9.3 Septic Tank (7501)	None	None		X		
10.0 Hydrofracture Injection Wells and Grout Sheets						
10.1 HF Experimental Site 1	Cs-137	3.5×10^1		X[f]	X[f]	
10.2 HF Experimental Site 2	Cs-137	5.0×10^1		X[f]	X[f]	
10.3 Old Hydrofracture Facility	Sr-90	4.0×10^4		X[f]	X[f]	
	Cs-137	6.1×10^5				
	Th, U, TRU	Unknown				
	Hz	Unknown				
10.4 New Hydrofracture Facility	Sr-90	6.4×10^5		X[f]	X[f]	
	Cs-137	8.4×10^4				
	Th-232	>4.0 (4.0×10^4)				
	U-238	>2.0×10^1 (6.0×10^4)				
	TRU	2.1×10^3				
	Unidentified	2.1×10^4				
	Hz	Unknown				
11.0 White Wing Scrap Yard						
11.1 White Wing Road Storage Area	Cs-137	$\leq 1.0 \times 10^{-1}$		X	X	
	U-238	$<1.0 \times 10^{-2}$ est.				
	Pu-239	<2.0				
	Hz	Unknown				

Table 4.1. (continued)

	Site	Contaminant	Inventory[b] [Ci (kg)]	RCRA Permit	RCRA Sect. 3004 (u)	DOE Orders 5480.14	DOE Orders 5820.2
12.0	Closed Contractors' Landfill						
	12.1 Landfill (7658)	Unidentified	Presence unconfirmed		X	X	
13.0	Environmental Research Areas						
	13.1 Cs-137 Contaminated Field (0800)	Cs-137	≤5.8			X	
	13.2 Cs-137 Erosion Study (0807)	Cs-137	$\leq 9.0 \times 10^{-3}$			X	
14.0	Tower Shielding Facility (TSF)						
	14.1 TSF Scrap Yard (7702)	Neutron activation products	$<<1.0 \times 10^{3}$ est.		X	X	
		U-238	1.2 (3.5×10^{3})				
		Na	$(>6.1 \times 10^{4})$				
	14.2 Septic Tank (7750)	None	None		X		
15.0	ORNL Facilities at Y-12						
	15.1 Cyclotron Z-Oil (9201-2)	PCB	1986 Action		X[e]		X[e]
	15.2 Transformers (9201-2, 9204-1, 9204-3, SY200 Yard)	PCB	1986 Action		X[e]		X[e]
16.0	HPRR Area						
	16.1 Cs-137 Forest (7759)	Cs-137	$\leq 2.7 \times 10^{-1}$			X	
	16.2 Process Waste Basin (7711)	Unidentified	Presence unconfirmed		X		
17.0	ORNL Services Area						
	17.1 Septic Tank (7000)	Unidentified	Unknown		X		
	17.2 Waste Oil Tanks (7002W, 7009E, 7075, 7021E)	Unidentified	Unknown	X	X		
	17.3 Waste Oil Truck (7030E)	Unidentified	Unknown	X	X		
	17.4 Photographic Waste Tanks (7075A, 7075B)	Unidentified	Unknown		X		

Table 4.1 (continued)

	Site	Contaminant	Inventory[b] [Ci (kg)]	RCRA		DOE Orders	
				Permit	Sect. 3004 (u)	5480.14	5820.2
18.0	Consolidated Fuel Reprocessing Area						
	18.1 EGCR Ponds (7600A, 7600B)	Unidentified	Unknown		X		
	18.2 Paint Solvents Storage (7615)	Unidentified	Unknown		X		
	18.3 Septic Tank (7616)	Unidentified	Unknown		X		
	18.4 Waste Acid Tanks (7602, 7601)	Unidentified	Unknown		X		
	18.5 Waste Retention Basin (7613)	Unidentified	Unknown		X		
19.0	Hazardous Waste Treatment and Storage Facilities						
	19.1 Hazardous Waste Storage Facility (7652)	Unidentified	Unknown	X			
	19.2 Chemical Waste Storage and Cylinder Area (7653)	Unidentified	Unknown	X			
	19.3 Long-Term Hazardous Waste Storage Facility (7654)	Unidentified	Unknown	X			X
	19.4 Mixed Waste Storage Facility (7651)	Unidentified	Unknown	X	X		X
	19.5 Leaking Gas Cylinder Area (7659A)	Unidentified	Unknown	X	X		
	19.6 Reactive Chemicals Disposal Area (7659B)	Unidentified	Unknown	X	X		
20.0	Oak Ridge Land Farm						
	20.1 Municipal Sewage Sludge Application Site (XF1226)	Co-60	7.4×10^{-2}		X		
		Sr-90	1.3×10^{-2}				
		Cs-137	4.4×10^{-2}				
		Pu-239	1.0×10^{-3}				
		Cd	(1.8×10^{2})				
		Ni	(1.1×10^{3})				
		Pb	(4.6×10^{3})				

[a]*Inactive* refers to tanks no longer in service; *active* refers to operating tanks.
[b]Numbers in parentheses are measured in kilograms.
[c]Inactive lines only. Active lines are covered under RCRA permit.
[d]Presently on RCRA permit but are being removed.
[e]Also regulated under the Toxic Substances Control Act.
[f]Also regulated under the Underground Injection Control Program.
Note: Hz refers to hazardous wastes.

Table 4.2. Recommended actions for the WAGs

Wag	Description	Recommended action	Comment
1	Main Plant Area	RI plan	Of the 99 SWMUs, 23 are tanks in service that are permitted by rule, 6 are facilities included in the NPDES permit, 3 are SWMUs (1.4, 1.53 and 1.54) that have no releases.
2	WOC/WOL	RI plan	Both SWMUs in this WAG have continuing releases.
3	SWSA 3 Area	RI plan	There are data indicating that the three SWMUs in WAG 3 have produced releases.
4	SWSA 4 Area	RI plan	Two of the three SWMUs (4.1 and 4.3) have documented releases. SWMU 4.2 no longer contains radioactive material and has no release.
5	SWSA 5 Area	RI plan	The LLW concentrate tanks (SWMU 5.8a–h) are still in service and are included in ORNL's permits. SWMU 5.10 is an operating facility subject to DOE 5820.2. The balance of the SWMUs have reported releases (with the exception of SWMU 5.5a–e, which have not had reported releases).
6	SWSA 6 Area	RI plan	SWMU 6.3 has had no release. SWMU 6.2 has never been used, and no releases are recorded. Only SWMU 6.1 (SWSA 6) shows indications of continuing releases of radionuclides. Part of this facility is being closed under RCRA guidance. An RI plan has been prepared (12/86) for SWMU 6.1.
7	Pits and Trenches Area	RI plan	Only one SWMU (7.10) has reported no release. All of the other SWMUs are potential or existing sources of continuing releases.
8	Melton Valley Area	RI plan	Two of the SWMUs are active facilities (SWMUs 8.4 and 8.8). SWMU 8.10 is not operating at this time; however, a permit for operating is in preparation. SWMUs 8.5, 8.6, and 8.7 are still in service and have reported no releases. SWMU 8.9 is a sewage treatment plant that should not be included in Section 3004(u).
9	HRE Area	RI plan	Of the three SWMUs in WAG 9, SWMU 9.3 (septic tank) should be removed from Section 3004(u) evaluations.
10	Hydrofracture	RI plan	An RI plan was prepared for this WAG in February 1987 and is currently under review by EPA and TDHE.
11	White Wing Scrap Yard	Additional sampling	Some indication of surface contamination by radionuclides. Additional radiological surveys recommended to allow more detailed evaluation of potential for release. Suggest soil sampling and beta-gamma walkover survey.

Table 4.2 (continued)

Wag	Description	Recommended action	Comment
12	Old Contractors' Landfill	Additional sampling	Additional sampling and survey studies recommended for a more detailed evaluation of site. No records exist for materials placed in site; preliminary sampling indicates some possible contamination of site.
13	Environmental Research Areas	Additional sampling	One SWMU (13.2) showed no releases in the preliminary sampling survey. SWMU 13.1 indicated that some Cs-137 had migrated from experimental plots. Additional sampling suggested to evaluate potential for continuing release.
14	Tower Shielding	Delete	Scrap Yard (SWMU 14.1) contains radionuclides (activation products); however, there is no record of releases. Preliminary sampling survey confirms no release. SWMU 14.2 (septic tank) should be removed from further Section 3004(u) evaluations.
15	ORNL Facilities at Y-12	Additional sampling	Most of the contaminants have been removed, or are being removed as a part of ongoing DOE remedial action programs. One release reported is related to contamination from one transformer leak (PCBs). Further sampling to identify potential contamination is suggested.
16	Health Physics	Delete	One SWMU (16.2) has never been used. SWMU 16.1 is an environmental research area contaminated with mCi levels of Cs-137. No releases have been reported. Sampling surveys confirm no release.
17	ORNL Services Area	RI plan	Although no records exist of releases from any of the SWMUs listed, the preliminary sampling survey indicates that contamination is being released. An RI plan is suggested to identify the source(s).
18	Consolidated Fuel Reprocessing Area	Delete	There are no recorded releases from any of the SWMUs. Preliminary sampling surveys have shown no indication of radionuclide or hazardous material releases.
19	Hazardous Waste	Additional sampling	All of the SWMUs in this WAG are permitted under RCRA. Preliminary sampling surveys have shown no indication of radionuclide or hazardous material releases. Additional sampling for organics needed for confirmation.
20	Oak Ridge Land Farm	Delete	Preliminary sampling surveys have shown no indication of radionuclide or hazardous material releases. Site usage has been terminated.

4.2 THE ORNL RI/FS PROGRAM

Proposed enforcement of the RCRA Section 3004(u) provisions involves a series of steps (EPA 1986a, 1986b). The most significant of these are a Remedial Investigation [nomenclature: RFI(RCRA) or RI(CERCLA); equivalent to Phase II in DOE Order 5480.14 (DOE 1985), which implemented CERCLA at DOE facilities], followed by a Feasibility Study [FS; corresponds to the CERCLA-FS and the RCRA Corrective Measures Study (CMS); Phase III in the DOE Order]. These provide the basis for determining the extent of contamination problems and the scope of needed corrective actions. The overall process begins with identification of sites requiring an RI/FS*, i.e., with demonstrated or potential releases, through a RCRA Facility Assessment (RFA): The objective of the present report.

A modified RAP strategy was developed to implement the RCRA corrective action provisions (Berry et al., in press) that is believed to be responsive to regulatory concerns, yet is technically defensible in light of the complexity of the ORNL situation. Because of the large number of sites to be considered and the hydrogeologic complexity of the ORNL area, it was apparent very early that treating sites individually in the new regulatory framework would result in an unmanageable situation. Hence, the strategy was reoriented toward Waste Area Groupings (WAGs, as discussed in Sect. 1.1).

The largest single change in RAP strategy involved the implementation of a comprehensive RI/FS program. Preliminary schedules were developed for the primary WAGs based on a planned five-year intensive effort (Fig. 4.1 and Table 4.2). Initial estimates indicate an expenditure of approximately $25M over the lifetime of the effort, including both ORNL and subcontractor involvement. The large number and considerable diversity of the remedial action sites to be investigated, coupled with the hydrogeologic complexity of the ORNL environs, presents a unique challenge to ORNL, DOE, and regulatory authorities in the EPA and TDHE. Hence, both cost estimates and schedules are subject to significant changes as more information becomes available.

Ten of the WAGs were already believed to require the full RI/FS treatment prior to completion of the RFA, and tentative dates for completion of the interim steps are given in Fig. 4.1. For the remaining ten groupings, it was planned that schedules for detailed site investigations or assess-

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*ORNL-RAP nomenclature reflects early RCRA Section 3004(u) terminology derived from CERCLA.

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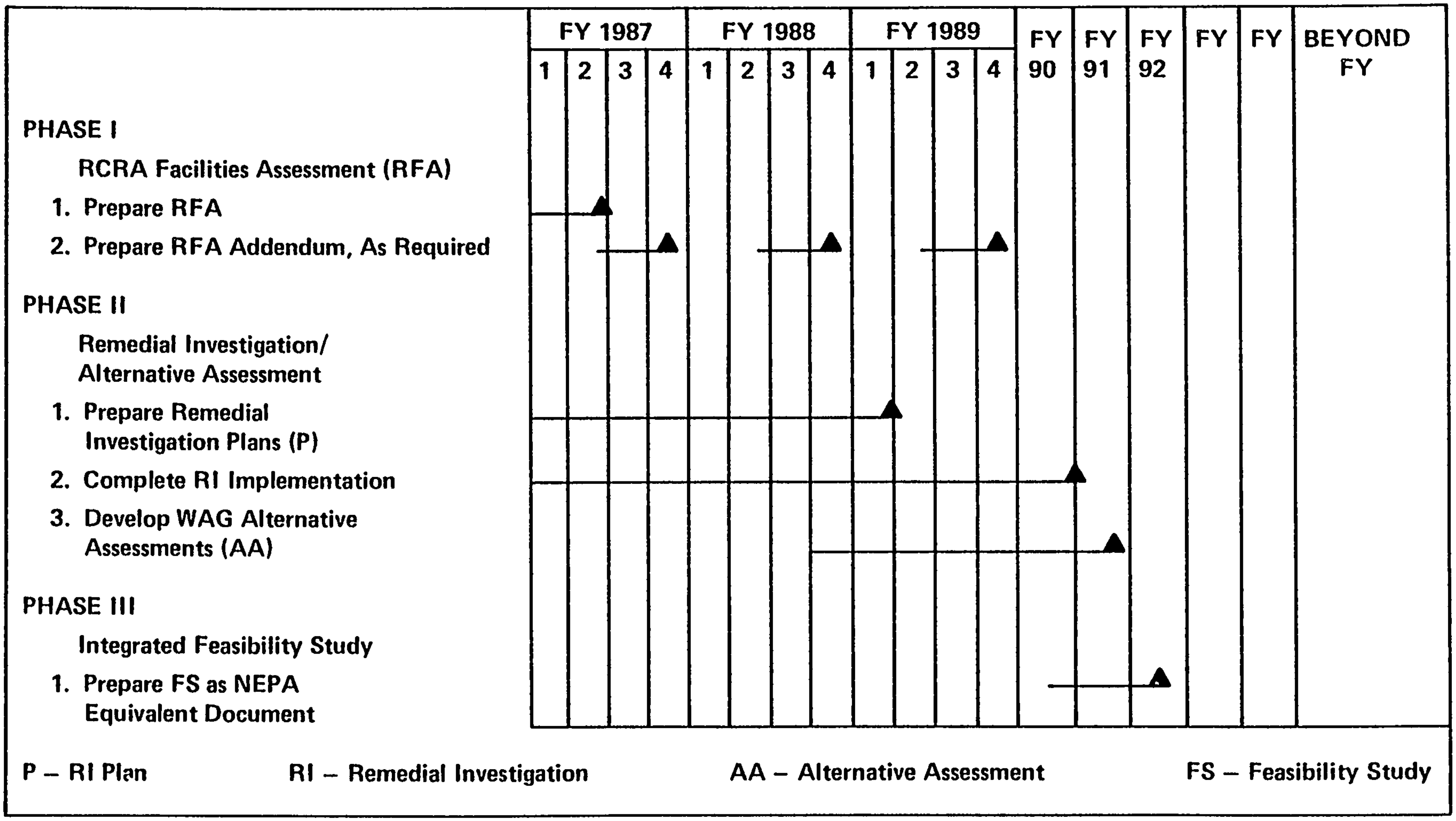

Fig. 4.1. ORNL RI/FS activities.

ments of remedial action alternatives would be developed during preparation of the RFA. These either have been determined (WAGs 14, 16, 17, 18, and 20) or will be determined by August 1987 (WAGs 11, 12, 13, 15, and 19) during a follow-up activity to the RFA (Table 4.3). In the former case, RIs are not deemed to be necessary for WAGs other than WAG 17, and, in the latter, information is currently insufficient for WAGs 11 through 13 15, and 19 to make a final determination whether an RI is needed.

Under the preliminary plan outlined in Fig. 4.1, detailed Alternatives Assessments (AAs) would be prepared for each WAG requiring an RI in the six months immediately following completion of the RI. These AAs would then be integrated into a single ORNL-FS (CMS), which would have to be the functional equivalent of an Environmental Impact Statement (EIS) in order to comply with the requirements of both EPA regulations and the National Environmental Policy Act (NEPA). The practicability of DOE compliance with NEPA through the RCRA (or CERCLA) process is an unresolved question.

4.3 REMEDIAL ACTION PROGRAM IMPLEMENTATION

The changes in RAP strategy have led to a phased Remedial Action Program, subdivided into six major phases that have been designed to support and complement the comprehensive RI/FS activities:

- Preliminary Assessment/Site Investigation,
- Maintenance, Surveillance, and Corrective Action,
- Remedial Investigations/Feasibility Study (RI/FS),
- Technology Demonstrations,
- Program Strategy Development,
- Site Decommissioning/Closure.

Some of these activities will provide specific contributions to RI plans, AAs, or the sitewide FS; others will result in more generic contributions. Although the schedule for completion of RIs and AAs has been staggered over time (Fig. 4.1, Table 4.3), it is still necessary to ensure from the very outset that for all sites/WAGs (1) interim corrective measures are provided to mitigate potential

Table 4.3. Preliminary schedules for ORNL Remedial Investigations/Feasibility Study

	Waste area grouping	Completion schedules by phases[a,b] (month/year) I RFA	IIA (—RI or RFI—)
1	Main Plant Area	4/87	12/87
2	White Oak Creek and White Oak Lake	4/87	12/87
3	Solid Waste Storage Area 3	4/87	6/88
4	Solid Waste Storage Area 4	4/87	12/87
5	Solid Waste Storage Area 5	4/87	3/88
6	Solid Waste Storage Area 6	4/87	12/86
7	LLW Pits and Trenches Area	4/87	9/88
8	Melton Valley Area	4/87	6/88
9	Homogeneous Reactor Experiment Area	4/87	3/88
10	Hydrofracture Injection Wells and Grout Sheets	4/87	2/87
11	White Wing Scrap Yard	8/87[c]	*c*
12	Closed Contractors' Landfill	8/87[c]	*c*
13	Environmental Research Areas	8/87[c]	*c*
14	Tower Shielding Facility	4/87	*d*
15	ORNL Facilities at Y-12	8/87[c]	*c*
16	Health Physics Research Reactor Area	4/87	*d*
17	ORNL Services Area	4/87	12/88
18	Consolidated Fuel Reprocessing Area	4/87	*d*
19	Hazardous Waste Facilities	8/87[c]	*c*
20	Oak Ridge Land Farm	4/87	*d*

[a]All schedules following completion of Phase IIA (RI or RFI plans) are tentative and subject to change based on DOE and regulatory agency reviews/negotiations. All RCRA units within a grouping subject to new or interim status permit requirements will also adhere to the applicable permit requirements.

[b]Comparison between phases in DOE Order 5480.14, CERCLA, and RCRA Section 3004(u):

- Phase I is comparable to the EPA's RCRA Facility Assessment (RFA). RFA report covering all units will be provided to EPA in April 1987.
- Phase IIA is comparable to the EPA's Remedial Investigation (RI) Plan under CERCLA or the RCRA Facilities Investigation (RFI) Plan.

[c]The results of the RFA provided insufficient information to make a final determination of site status. Follow-up environmental sampling will be conducted to attempt a more adequate evaluation by August 1987 of the need for further actions. It is not anticipated that major actions will be required (see Sect. 4.1).

[d]No further action is deemed necessary (see Sect. 4.1).

problems and (2) technology options are evaluated well in advance of potential needs. The RCRA Corrective Action Plan requires documentation of relevant information and data needs for interim measures and technology evaluations in individual RI Plans (EPA 1986b). The ORNL strategy has been to comply with the spirit of these requirements on a generic, sitewide basis, well in advance of preparation of RI Plans for specific WAGs. Thus, specific program phases are devoted exclusively to these activities.

The work-breakdown structure developed to implement the RAP phases and to guide the overall effort is presented in Table 4.4, along with an outline of the scope of work to be included in each program phase. During the next few years, the major emphasis will be on (1) providing preliminary assessments of *all* sites under RCRA regulations (including establishment of a comprehensive groundwater monitoring program), (2) implementing a structured maintenance and surveillance program for *all* sites and performing corrective actions on priority sites as necessary, and (3) conducting the RI/FS (Fig. 4.2). This emphasis is reflected in the allocation of 70% of the available funds for those activities (Phases I to III; Berry et al., in press) over the next three years. While the preliminary assessment phase is anticipated to peak in FY 1987 and be completed by FY 1990, the other two phases will continue to grow through FY 1989. The remainder of the program budget will be allotted to developing strategies and technologies for remedial actions, implementation of remedial actions on priority sites, and support of the program management function. During the planning years, completion of two major decommissioning projects is anticipated: Fission Product Development Laboratory and the Metal Recovery Facility (Fig. 4.2, Table 4.4).

Upon completion of the RI/FS sequence, major corrective (closure/decommissioning) actions will be implemented according to priorities and schedules negotiated with the EPA and TDHE. The magnitude of the efforts for long-term management of ORNL sites can only be roughly approximated; however, initial indications are that long-term solutions for dealing with the entire inventory of RAP sites will require a period of 15–20 years and the expenditure of 1-billion unescalated dollars to implement (Berry et al., in press). Meeting this objective (and schedule) will require that resources are made available when needed and that the concept of in situ stabilization is accepted. It must be stressed that the resource estimates are based principally on implementation of in situ measures to stabilize wastes at most ORNL sites, in accordance with the strategy outlined in Berry et al. (in press). Significant alterations in that strategy could result in major increases in resources and time allotments for implementation.

Table 4.4. Remedial Action Program work-breakdown structure

	Work-breakdown structure	Scope[a]
I.	Preliminary Assessment/ Site Investigation	Provide scoping surveys (FY 1986), prepare RFA Report (FY 1987), document existing knowledge for RI/FS data packages on compatible schedule, and complete basic groundwater monitoring network (FY 1990), for all WAGs. Continue site characterization: • Clinch/Tennessee rivers: BMPAP. • Line leaks: Groundwater studies. • Process Ponds: Groundwater studies and leak testing. • SWSA 4: Bathtubbing trenches. • WOC/WOL: Aerial survey; BMPAP; discharge and stream sediment monitoring; groundwater studies.
II.	Maintenance, Surveillance, and Corrective Actions	Provide planning and implementation of routine site maintenance and surveillance to ensure containment, document surveillance, and identify needed corrective actions. Perform project planning and implementation of corrective actions: • High-Level Radiochemical Analytical Laboratory (3019B): Upgrade. • Main Plant Area Groundwater: Collection and treatment. • MSRE (7503): Fuel storage upgrade. • Process Ponds: Corrective actions. • SWSAs: Reduction of wildlife access to contaminated seepage areas.
III.	Remedial Investigations/ Feasibility Study (RI/FS)	Develop and implement characterization plans for all WAGs, outline closure alternatives through alternatives assessments and a comprehensive, integrated feasibility study. Establish management and support organization, implement major support subcontract (FY 1987) according to regulatory approved sequence for each WAG (FY 1987–1991).
IV.	Technology Demonstrations	Provide coordinated demonstrations and evaluations of RA techniques on a schedule compatible with future use in RAP corrective actions. Evaluate past corrective actions: • LLW Trench 7 Grout Curtain. • SWSA Near-Surface Seals. • SWSA 6 French Drain.

Table 4.4 (continued)

Work-breakdown structure	Scope[a]
	Demonstrate potential RA technologies: • Decommissioning Tooling: Arc Saw and Water Jet (FY 1987–1989). • Geophysical Trench Mapping: SWSAs (FY 1987) • In Situ Grouting: LLW Trench (FY 1987–1989); TRU-Waste Trench (FY 1987–1991). • In Situ Vitrification: LLW Pits Trenches Area (FY 1987–1991). • Sediment Stabilization: Process Ponds (FY 1987–1989). • Subsurface Radiation Detection: (FY 1987). • Trench Area Closure Demonstration: SWSA 6 (FY 1987–1992).
V. Program Strategy Development	Provide overall strategy through integration and synthesis of information from: Results of Phases I-IV; analyses of institutional, regulatory, and technical issues; development of site closure criteria and establishment of EPA/TDHE interface (FY 1986–1987). Develop site performance models: • Contaminant Transport: Groundwater; Surface Waters. • Pathways Analyses: RAP Site Screening (FY 1987). • WOC/WOL Discharge Forecasting and Clinch River Dispersion/Transport. Perform site-wide characterization and assessments, focused on hydrogeologic/regulatory issues and groundwater strategy in FY 1987–1989. Provide RAP documentation: • Decommissioning Plans: SCFP (FY 1987); SCMP (FY 1987); SFMP (FY 1987; revision). • Input to ORNL Long-Range Plan. • Strategy Document Revisions.
VI. Site Decommissioning/Closure	Develop engineering designs and implement site decommissioning/closure actions for cost-effective management of surplus facilities or for priority projects defined by the RI/FS process.

Table 4.4 (continued)

Work-breakdown structure		Scope[a]
		Decommissioning of priority sites: • FPDL (3517): (FY 1986–1989). • MRF (3505): (FY 1986–1989). • Hydrofracture Wells: Plugging and abandonment. • SWSA 6: Interim closure activities. • Waste Tank Systems: Analyses of contents for closure planning. • Other Priority Sites: • (FY 1989–End of RAP).
VII.	Remedial Action Program Support	Provides management and database support for overall program.

[a]Key to table abbreviations:

BMPAP	Biological Monitoring Program and Abatement Program
EPA	Environmental Protection Agency
FPDL	Fission Product Development Laboratory
LLW	Low-Level Radioactive Waste
MRF	Metal Recovery Facility
MSRE	Molten Salt Reactor Experiment
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
SCFP	Surplus Contaminated Facilities Program
SCMP	Site Corrective Measures Program
SFMP	Surplus Facilities Management Program
SWSA	Solid Waste Storage Area
TDHE	Tennessee Department of Health and Environment
TRU	Transuranic
WOC	White Oak Creek
WOL	White Oak Lake

The activities associated with each RAP phase are outlined in the following sections; specific details, including schedules whenever practicable, are shown in Table 4.4.

4.3.1 Preliminary Assessment/Site Investigation

Preliminary characterization studies are ongoing to provide the basic information necessary for initial regulatory assessments. These activities include literature reviews on site characteristics and contaminant releases, as well as preliminary environmental surveys to supplement existing databases. As the precursor to the RI/FS, this report documents the results from a RCRA Facility Assessment, conducted under this program phase to document site characteristics and determine the need for follow-up efforts for all WAGs. A related activity involves documentation of existing knowledge on individual WAGs into *data packages* to support the RI/FS on compatible schedules.

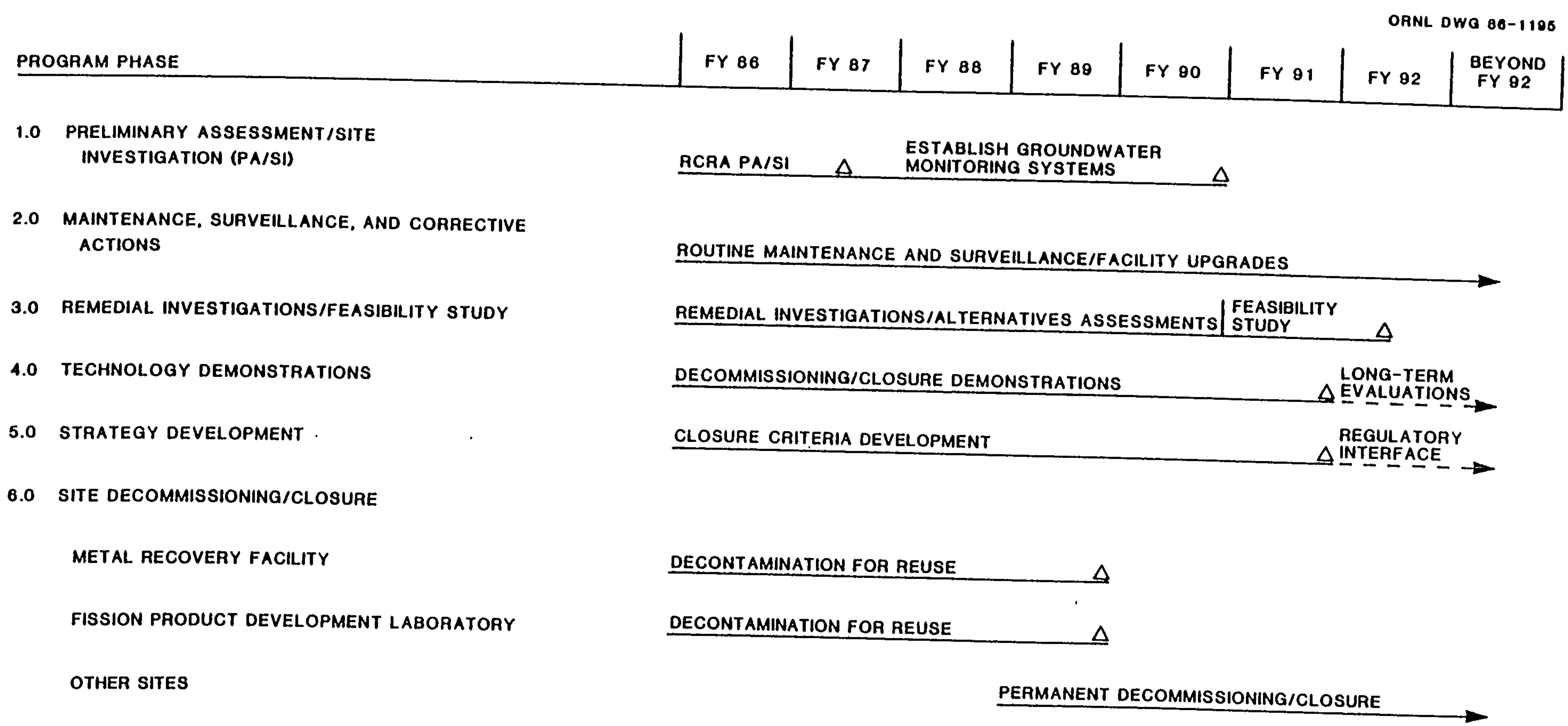

Fig. 4.2. Remedial Action Program implementation schedule.

Other major objectives include completion of the basic perimeter groundwater monitoring network for principal WAGs by FY 1990 and the continuation of comprehensive site characterization in selected WAGs in support of the RI/FS. Groundwater contamination studies associated with a variety of sources are ongoing in ORNL's main plant area (WAG 1). Comprehensive longer-term biological monitoring and geohydrologic investigations on the White Oak Creek/White Oak Lake system are also being conducted under this phase.

4.3.2 Maintenance, Surveillance, and Corrective Actions

Routine maintenance and surveillance will be provided to ensure adequate containment of residual contaminated materials at all sites. This will be performed until final decommissioning/closure is undertaken to mitigate potential threats to human health and environment (EPA 1986b). Maintenance and surveillance plans for directing and documenting the necessary activities are being prepared. These will reflect the differing needs of the wide variety of sites to be maintained and will be updated to incorporate changes over time. Major repairs or corrective actions may also be undertaken, as needed, to keep sites in a safely contained state, requiring only routine maintenance and surveillance. Such measures must be consistent with and integrated into any long-term corrective action (EPA 1986b). Project planning and implementation for such corrective measures, along with resources for collection/treatment of some contaminated groundwaters, will also be provided by this program phase.

4.3.3 Remedial Investigations/Feasibility Study

The largest single change in RAP direction to comply with RCRA Section 3004(u) involves the implementation of the comprehensive RI/FS program. It has been proposed that the RI/FS be implemented through an intensive five-year program to address concerns expressed by the EPA. Accomplishment of a project of this magnitude requires a major support subcontractor (or team), guided by RAP technical staff and the ORNL database from historical and preliminary site characterization studies. The subcontractor selection and award process is expected to be completed in June 1987. Preliminary schedules for completion of the RI/FS phase for the principal WAGs have been prepared (Sect. 4.2). Detailed Alternatives Assessments would be prepared for each WAG following completion of the RI activities. These AAs would then be integrated into a single FS for

ORNL, providing a comprehensive assessment of the need, extent, priority, and timing for future remedial actions. This FS would have to be the functional equivalent of an EIS in order to comply with both EPA regulations and NEPA.

4.3.4 Technology Demonstrations

The RCRA Corrective Action Plan (EPA 1986b) requires that potential technologies for "containment, treatment, remediation, and/or disposal of contamination" be identified prior to the start of any RI, along with any field data needed to "facilitate the evaluation and selection of the final corrective measure or measures (e.g., compatibility of waste and construction materials, information to evaluate effectiveness, treatability of wastes, etc.)." The objective of this phase is to provide coordinated demonstrations and evaluations of remedial action technologies on a schedule compatible with future corrective action needs. Technological alternatives will first be screened for general applicability to ORNL environmental and waste management conditions. Field-scale technology demonstrations will then be performed, where necessary, at specific sites prior to full-scale implementation. A companion effort will involve comprehensive evaluations of performance both for new demonstrations and for past corrective actions undertaken at several sites.

4.3.5 Program Strategy Development

Corrective (decommissioning/closure) actions must be performed such that integrated releases from ORNL are within regulatory limits and that limited resources for corrective actions are optimally apportioned among the many remedial action sites. This phase provides the overall RAP strategy through integration and synthesis of information from (1) results of the first four phases; (2) analyses of institutional, regulatory, and technical issues; (3) development of site closure criteria; and (4) establishment of an interface with EPA and Tennessee state regulatory authorities. Another key activity is the development of effective contaminant transport and pathways analysis models needed for assessment of overall ORNL site performance. Performance of characterization studies and assessments needed to resolve key regulatory and technical issues of ORNL-sitewide concern (e.g., regional hydrogeology affecting contaminant transport off-site, effectiveness of groundwater collection/treatment strategies) also are dealt with in this program phase. In addition, key programmatic documentation, including conceptual and long-range plans, are provided and updated periodically to reflect changes mandated by new information.

4.3.6 Site Decommissioning/Closure

The ultimate objective of this phase is to provide long-term containment of residual contaminants by placing each site into a permanently stabilized state, requiring only periodic monitoring and minimal maintenance to ensure proper performance. Upon completion of the RI/FS sequence, major decommissioning/closure actions will be implemented according to priorities and schedules negotiated with regulatory authorities. The magnitude of the effort for long-term management of ORNL sites can only be roughly approximated because site-characterization information is still quite preliminary, and current technology limitations make achievement of this objective problematic for many historically contaminated sites, particularly for those containing transuranic wastes. Schedules will be developed during the latter phases of the RI/FS studies and submitted for DOE, EPA, and TDHE approval as they become finalized. Because of the need to ensure functional equivalence of the RI/FS process with NEPA, it is expected that most major actions will be carried out *after* completion of the entire RI/FS sequence. However, the need for interim decommissioning/closure actions may be identified during the RI/FS sequence. Such higher priority sites will require near-term corrective actions; lower priority sites will continue to be maintained (as described in Sect. 4.3.2) prior to final disposition.

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APPENDIX

APPENDIX A

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION ON HYDROFRACTURE

This appendix has been prepared to specifically address information needs identified for ORNL's hydrofracture operations in the letter from Jack E. Ravan to Joseph Lenhard, dated September 29, 1986. Following are the specific items of information that were requested along with statements that refer the reader to accompanying tables or technical write-ups.

(1) Catalog of all past data and reports by DOE or its contractor personnel. A complete list of references for work associated with the hydrofracture facilities is included (see Attachment A).

(2) Construction details of the injection wells. A review of the history of the construction of the four injection wells is attached; there is little information available on the construction history of the first three wells. More complete information for the fourth well is contained in the reference cited (Attachment B).

(3) Amounts of radioactive waste disposed. The data relative to this item are found in the attached tables (Tables 1 and 2) for the two sites [Old Hydrofracture Facility (OHF) and New Hydrofracture Facility (NHF)] at which radioactive material was disposed (Attachment C).

(4) Composition of the waste. Data for the types of radionuclides, RCRA Appendix 9 hazardous materials, and nitrate for wastes disposed at the OHF and the NHF are found in Tables 3 through 17 (Attachment D).

(5) Amount of grout added. These data for injections at the OHF and the NHF are found in Tables 1 and 2 (Attachment C).

(6) Approximate depths at which injections were made. The depths at which waste injections were made are found in Tables 1 and 2 (included in Attachment C).

(7) Volume and type of water used in fracturing and flushing wells. There are four types of water that can be identified associated with the injection operations: water injected with the solids, free test water, process water, and phase separated water. A discussion of these parameters is found in the two attachments: Quantity of Water Injected at the OHF and Quantity of Water Injected at the NHF. Each of these attachments contains a table that lists the quantities of each type of water for each facility (Attachment E).

(8) Percentage of waste released in liquid form from the normal injection procedures. There are no data upon which to make this evaluation. It is known that some quantity of the more soluble nuclides (principally Sr-90) is released into the groundwater in the vicinity of the injected grout. Whether this release occurs prior to and during the setting of the grout or after the grout sets is not known. Evaluations are underway at ORNL to determine the long-term leachability of the grout. There is no evidence to indicate that any significant percentage of the total injected radionuclides has been, or will be, released into the liquid (groundwater plus injected water) after injection.

(9) Any problem associated with the injection. The attached discussion, Events and Situations Involving Uncontrolled Contaminant Release (modified from ORNL, 1987), summarizes problems that did or could have adversely impacted the environment (Attachment F).

(10) A schedule of past accidental releases. The attachment noted in Item 9 above contains this information (Attachment F).

(11) Copies of all ongoing and future reports concerning the hydrofracture facilities. ORNL will supply copies of all reports issued that are related to hydrofracturing.

Attachment A

CATALOG OF ALL PAST DATA AND REPORTS BY DOE
OR ITS CONTRACTOR PERSONNEL

Updated 3/13/87

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Attachment B

CONSTRUCTION DETAILS OF THE INJECTION WELLS

CONSTRUCTION HISTORY OF THE INJECTION WELLS

The injection well at the first hydrofracture site was installed in a 6-in. drill hole (300-ft deep) that had been drilled for an earlier study. A 3-in. J-55 casing was cemented in this hole and slotted at a depth of 290 ft. There are no records of the cement job. The subsequent injection at this site was made through this casing and slot.

The injection well at the second hydrofracture site was installed in a 8-in. drill hole. A 4-in. casing was cemented in this hole. There are no records of the cement job. A deviation survey indicated that the well was essentially straight. The finished well was slotted at 934 ft, and a grout injection made. It was later slotted at 694 ft, and a second grout injection was made. A subsequent series of shaped charge slotting tests were made at 686, 676, and 661 feet; these tests involved the injection of 27,000 gal and 57,000 gal of water. This well was subsequently cut off at grade, and a road was routed over it.

The construction of the injection well at the third hydrofracture site is shown in Figs. 1 and 2. The 9-5/8-in. surface casing was installed and cemented first; a 8-3/4-in. hole was drilled through the surface casing to a depth of 1050 ft. A 5-1/2-in. string of casing was inserted in this hole and cemented in place. There are no available records of the cement job. A deviation survey was made; it showed that the injection well was virtually vertical. Injections of grout and water were made at intervals from 988 to 782 ft.

The construction of the injection well at the fourth hydrofracture site is shown in Fig. 3. Details of the well installation and testing are given in Weeren et al. (ORNL/TM-4713 1974). The well deviates considerably from vertical; the bottom of the well (at 1107 ft) is about 130 ft SW of the top of the well. The deviation at 100-ft intervals is given in the above reference.

During a grout injection in 1982, the central 2-7/8-in. tubing string parted, allowing grout to flow down both the tubing string and the annulus. This resulted in the tubing string and the casing being cemented together. The subsequent recovery operations are described in

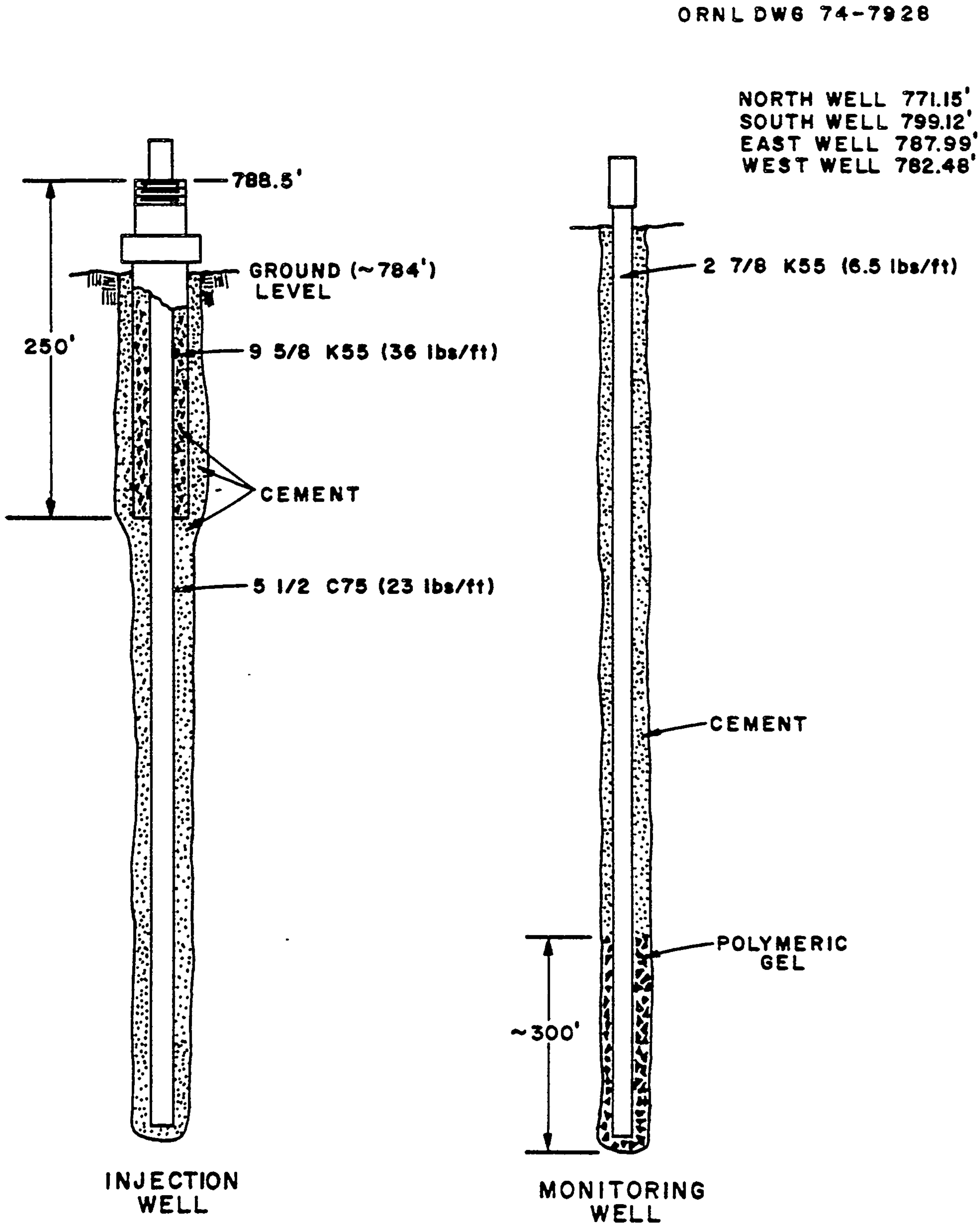

Fig. A.1. Design of Injection and Observation Wells

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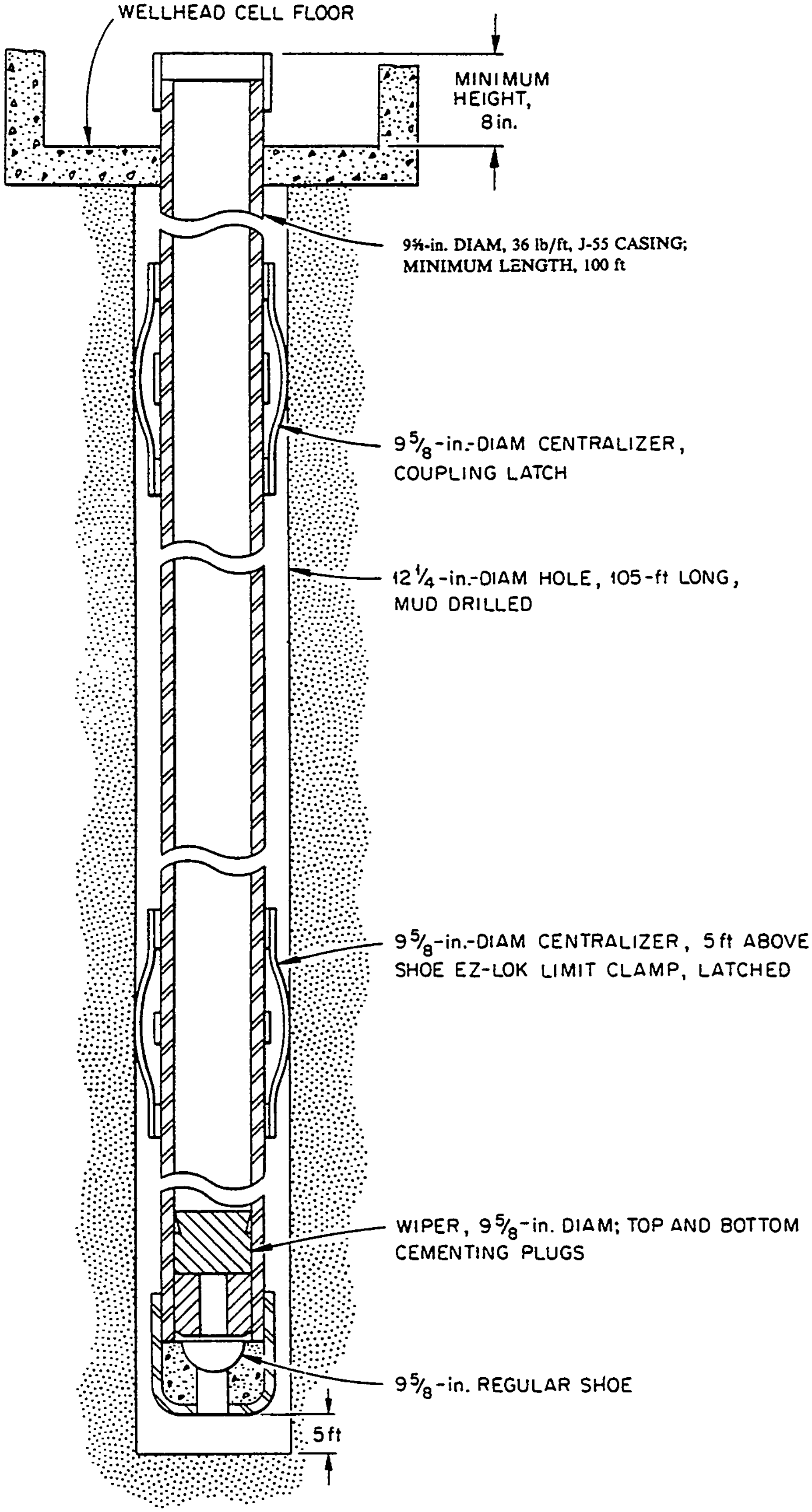

Fig. 2. Injection Well Construction - Surface Casing

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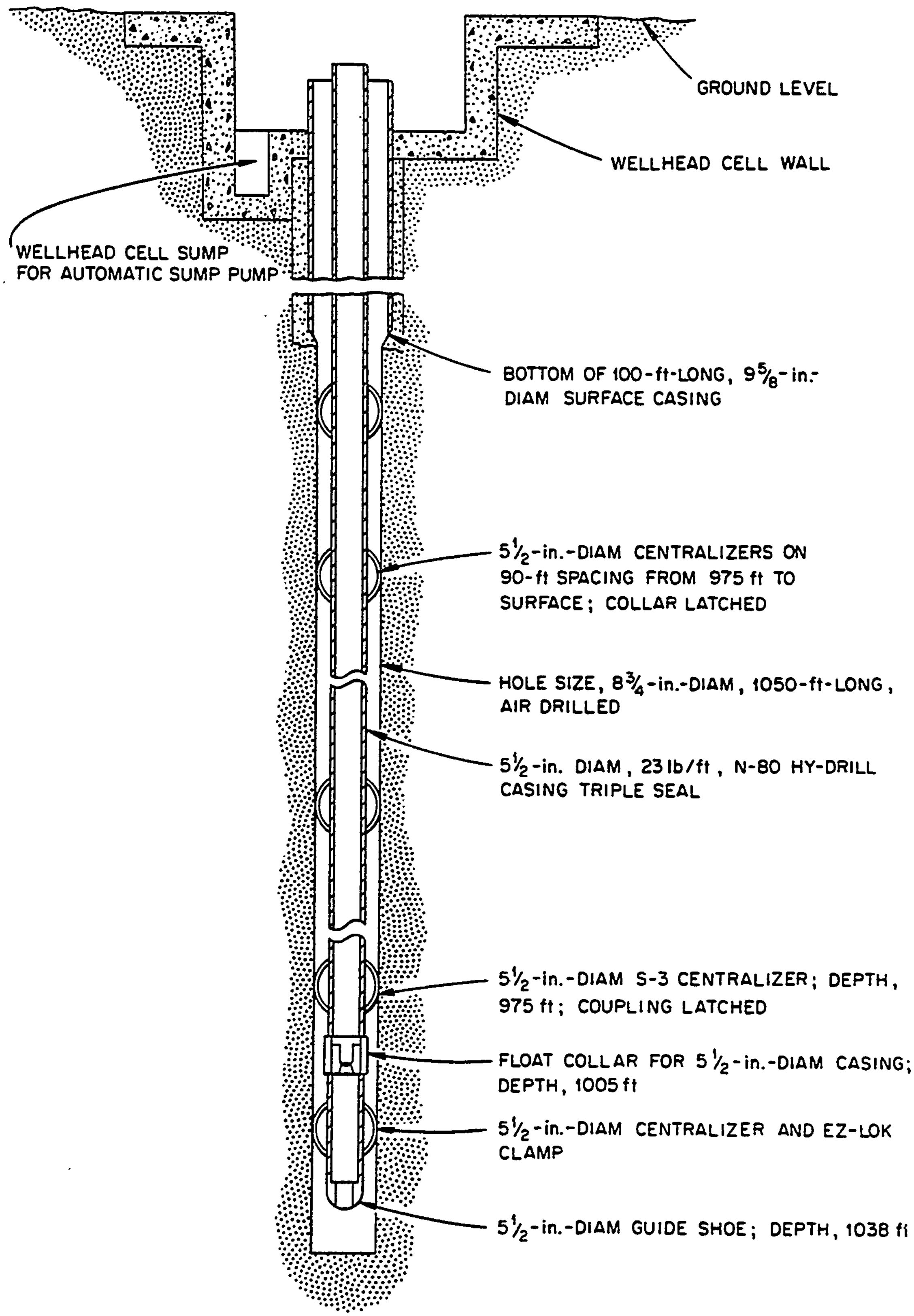

Fig. 3. Injection Well Construction - Well Completion.

Weeren et al. (1984). These operations resulted in a drastically altered well configuration. The original 5-1/2-in. casing was drilled out to a depth of approximately 760 ft. At this depth, the drilling tool refused to conform to the deviation of the casing and cut through the casing. The hole was extended to a depth of 1015 ft. A 2-7/8-in. tubing string was inserted and cemented to the new hole and the inside of the old casing. Nine subsequent injections were made through a slot cut in this 2-7/8-in. tubing string.

Attachment C

AMOUNTS OF RADIOACTIVE WASTE DISPOSED

APPROXIMATE DEPTHS AT WHICH INJECTIONS WERE MADE

AMOUNT OF GROUT ADDED

Table A.1. Summary of Injection Parameters At the OHF

Injection	Date	Depth (ft)	Waste Volume (Gal)	Grout Volume (gal)	Activity Injected (Ci) Sr-90[b]	Cs-137[c]	Cm-244	Pu-239
Experimental Injections								
1-7	2/64-8/65	845-872		678,000	1,436	5,237		
Operational Injections								
ILW-1A	12/12/66	872	36,000	95,197	3	19,950	NA[d]	NA
ILW-1B	12/13/66	872	36,000					
ILW-2A	4/20/67	862	86,000	230,405	1,050	58,500	NA	NA
ILW-2B	4/24/67	862	62,000					
ILW-3A	11/28/67	862	31,000	146,751	9,000	17,000	NA	NA
ILW-3B	11/29/67	862	52,000					
Water Test	12/13/67	852						
ILW-4A	4/03/68	852	24,010	130,675	4,300	51,900	NA	1.10
ILW-4B	4/04/68	852	62,180					
ILW-5	10/30/68	842	81,800	115,174	500	69,400	NA	1.15
ILW-6	6/11/69	842	79,350	126,331	8,900	89,000	NA	0.24
ILW-7	9/23/70	842	83,000	145,670	2,747	44,833	19.2	1.77
ILW-8	9/29/72	832	72,700	108,605	45	28,000	0.20	0.13
ILW-9	10/17/72	832	68,300	114,000	231	23,400	6.51	None
ILW-10	11/08/72	832	84,760	132,960	1,330	18,800	26.67	0.37
ILW-11	12/05/72	832	75,760	125,490	1,100	23,500	155.74	None
ILW-12	1/24/75	822	25,710	42,100	1,324	12,752	1.02	None
ILW-13	4/29/75	822	81,000	126,100	3,368	35,750	17.83	0.03
ILW-14	6/20/75	822	82,970	138,700	2,874	30,592	3.58	None
ILW-15	6/30/77	822	91,000	145,037	138	26,390	None	0.66
ILW-16	11/17/77	812	55,200	79,500	1,618	14,964	None	None
ILW-17	9/01/78	802	82,300	137,500	90	22,270	2.27	0.07
ILW-18	5/18/79	792	83,014	139,000	28	16,880	0.19	0.29
Total			1,426,054	2,323,907	38,640	603,881	233.21	5.81

[a] lb solid/gal liquid.
[b] Sr-90 is in equilibrium with Y-90. For every Ci of Sr-90, there is a Ci of Y-90.
[c] Cs-137 is in equilibrium with mBa-137. For every Ci of Cs-137, there is a Ci of Ba-137.
[d] NA = Not analyzed.

Table A.2. Summary of Injection Parameters At the NHF

Injection	Date	Depth (ft)	Waste Volume (L)	Grout Volume (L)	Activity Injected (Ci)				
					Sr-90[b]	Cs-137[c]	Cm-244	TRU	Other
ILW-19	6/16/82	1069	600,000	860,000	156	17,333	5	2	347
SI-1	8/10/82	1069	730,000	1,190,000	28,500	5,500	710	72	2,000
SI-2	9/23/82	1069	440,000	580,000	57,200	4,800	--	73	1,400
SI-3	10/26/82	1069	940,000	1,170,000	61,000	4,100	510	290	1,800
SI-4	4/08/83	990	730,000	920,000	11,000	450	96	130	230
SI-5	5/17/83	990	600,000	620,000	7,200	410	--	65	160
ILW-20	6/14/83	990	420,000	590,000	3,266	7,140	53	14	627
SI-6	7/12/83	990	770,000	850,000	67,553	2,750	1,060	240	930
SI-7	8/09/83	990	620,000	720,000	21,630	1,585	220	84	160
SI-8	10/25/83	990	740,000	916,000	217,400	14,800	2,980	357	3,400
SI-9	12/01/83	990	721,600	903,000	125,000	16,280	920	404	990
SI-10	1/25/84	990	700,000	946,000	41,100	5,600	763	375	760
ILW-21	1/27/84	990	462,000	606,000	3,500	2,100	71	19	510
Total			8,475,000	10,874,000	644,505	82,768	7,464	2,125	13,314

Attachment D

COMPOSITION OF THE WASTE

Table A.3. Radiochemical analyses of LLW tank contents for injection ILW-19 (nCi/mL)

Tank	Sr-90	Cs-137	Co-60	Eu-152	Eu-154	Eu-155	Ru-106	Pu-239	Pu-238	Am-241	Cm-244
W-24	550	34,000	140				210	1.8		5.5	25
W-25	200	37,000	100				5.3	0.19		0.63	2.9
W-26	160	21,000	61				820			3.2	1.7
W-27	150	29,000	82				1,000			1.5	0.58
W-28	8,500	13,000	200	1,100	690	260	1,600			290	690
W-29	7,400	15,000	290	1,600	1,100	340	2,100			580	1,100
W-29A[a]	170	14,000	34				260	0.17	0.63	1	11

[a]W-29A is the same contents as W-29, resampled and reanalyzed.

Source: ORNL/NFW-84/38.

Table A.4. Radiochemical analyses of LLW tank contents for injection SI-1 (nCi/mL)

Tank	Location	Sr-90	Cs-137	Cs-134	Co-60	Eu-152	Eu-154	Eu-155	Pu-239	Pu-238	Am-241	Cm-244
W-24	Middle	54,000	11,000	66	4,800	1,500	1,300	340	62	62	87	2,300
	Bottom	43,000	14,000	85	3,800	1,300	1,100	320	53	110	100	2,100
W-25	Middle	25,000	5,300	32	58	210	170	55	5.8	9	29	260
	Bottom	77,000	16,000	180	5,700	1,700	1,700	420	68	110	220	400
W-26	Middle	14,000	2,600	18	400	370	340	98	5	9.8	58	660
	Bottom	20,000	14,000	85	29	71	63	21	0.48	1.3	6.3	74
W-27	Middle	100,000	2,900	29	7.7	340	340	95	14	29	77	1,200
	Bottom	34,000	6,900	82	<1.1	24	<1.8	<11	<0.05	<0.05	<0.16	<0.13
W-30	Bottom	79,000	2,300	9.2	19	140	130	32	1.9	3.4	32	290

Source: ORNL/NFW-84/34.

Table A.5. Radiochemical analyses of LLW tank contents for injection SI-2 (nCi/mL)

Tank	Location	Sr-90	Cs-137	Cs-134	Co-60	Eu-152	Eu-154	Eu-155	Pu-239	Pu-238	U-233
W-24	Middle	54,000	8,700	53	79	110	79	26	8.7	21	190
	Bottom	46,000	8,700	53	2,400	79	53		26	19	150
W-25	Middle	54,000	13,000	53	1,400	79	110	53	24	16	180
	Bottom	81,000	16,000	160	920	110	110	26	11	34	240
W-26	Middle	160,000	2,700		3,200				50	110	45
	Bottom	110,000	13,000	110	4,000	110	110	<26	34	95	92
W-27	Middle	170,000	180		2,400	130	160	79	160	260	90
	Bottom	110,000	2,500		110	260	240	79	45	98	370

Source: ORNL/NFW-84/35.

Table A-6. Radiochemical analyses of LLW tank contents for injection SI-3 (nCi/mL)

Tank	Sr-90	Cs-137	Cs-134	Co-60	Eu-152	Eu-154	Eu-155	Pu-239	Pu-238	U-233	Am-241	Cm-244
W-24	92,000	1,200		970	290	230	96	100	49		200	640
W-25A	53,000	12,000	53	3,000	750	680	220	48	72	140	36	1,200
W-25B	38,000	3,000	11	850	210	230	81	130	54	37	110	400
W-25C	19,000	1,500	5.3	420	100	110	40	65	27	19	55	200
W-26A	100,000	2,100		410	130	250	110	270	110	26	350	360
W-26B	54,000	1,200		240	44	110	46	220	77	18	200	160
W-27A	98,000	920		360				27	22		13	16
W-27B	74,000	690		270				24	17		9.7	12
W-30A	53,000	12,000	53	3,000	750	680	220	48	72	140	36	1,200
W-30B	48,000	11,000	48	2,700	680	620	200	44	66	130	33	1,100

Source: ORNL/NFW-84/36.

Table A.7. Radiochemical analyses of LLW tank contents for injection SI-4 (nCi/mL)

Tank	Sr-90	Cs-137	Co-60	Eu-152	Eu-154	Eu-155	Pu-239[a]	Pu-238	U-238	U-233	Am-241	Cm-244
W-24	6,000	300	170		19	7.9	30	4	0.57	2	19	11
W-24A[b]	5,000	390	58	12	19		27	15	0.66	2.5	18	34
W-25	16,000	730	78	33	69	24	120	15	1.1	10	43	45
W-26	40,000	1,100	680	170	230	69	200	130	1.6	14	82	630
W-27	13,000	630	44	6	69	28	190	16	2.2	8.2	70	32
W-30	7,200	400	26		10	8.8	38	5.4	0.95	3	26	11
W-31	3,500	290	56		15	9.3	27	2.6	1.2	2.4	8.7	16

[a] Pu-239 data include Pu-240.

[b] The waste identified as W-24A was pumped from Bethel Valley after the major portion of the waste originally in W-24 had been injected.

Source: ORNL/NFW-84/37.

Table A.8. Radiochemical analyses of LLW tank contents for injection SI-5 (nCi/mL)

Tank	Sr-90	Cs-137	Co-60	Eu-152	Eu-154	Eu-155	Pu-239	Pu-238	U-238	U-233	Am-241	Cm-244
W-24	5,000	450	94	17	27		30	4.6	3	0.62	19	62
W-25	41,000	1,500	250	140	180	73	140	47	2.7	13	140	420
W-26	2,500	490	92	5.1	14	5.3	27	3	0.81	1.6	16	18
W-27	5,700	510	180	17	31	12	30	4.3	1.4	4.3	25	72
W-31	2,100	390	33	4.6	10	3.4	1.6	16	0.81	1.4	10	5.4

Source: ORNL/NFW-83/18.

Table A.9. Radiochemical analyses of LLW tank contents for injection ILW-20 (nCi/mL)

Tank	Sr-90	Cs-137	Cs-134	Co-60	Eu-152	Eu-154	Eu-155	Pu-239	Pu-238	U-238	U-235	U-233	Am-241	Cm-244
W-26	6,800	12,000	380	440	53	26	26	3.6	4				2.8	40
W-27	11,000	35,000		2,900	390	250	110	38	22	0.53	<0.3	7.6	36	340
W-28	3,600	4,900	130	50	160	96	33	49	18	<0.3	<0.3	1.1	3	170
W-29	6,100	7,600	120	74	28	220	8.7	2.4	2.7	<0.3	<0.3	1.1	2.2	31

Source: ORNL/NFW-83/25.

Table A.10. Radiochemical analyses of LLW tank contents for injection SI-6 (nCi/mL)

Tank	Sr-90	Cs-137	Co-60	Eu-152	Eu-154	Eu-155	Pu-239	Pu-238	U-238	U-238	U-233	Am-241	Cm-244
W-24	96,000	2,200	750	64	100	34	80	40	0.54	0.4	9.7	150	2,100
W-25	98,000	5,100	960	360	400	1,300	150	83	3	0.27	40	450	2,000
W-25A[a]	52,000	2,500	470	150	180	480	95	39	1.1	0.12	15	180	960
W-26	150,000	4,300	970	180	190	61	250	69	0.27	<0.27	5.4	71	2,400
W-27	110,000	7,800	760	220	180	72	190	58	3.2	>0.27	11	58	1,200
W-30	4,200	490	61	5.8	19	7.8	32	3				22	22
W-31	2,100	390	33	4.6	10	3.4	1.6	16	0.81		1.4	10	5.4

[a]W-25A is a combination of 37% W-25, 9% W-26, and 54% W-30.

Source: ORNL/NFW-83/34.

Table A.11. Radiochemical analyses of LLW tank contents for injection SI-7 (nCi/mL)

Tank	Sr-90	Cs-137	Co-60	Eu-152	Eu-154	Eu-155	Pu-239[a]	Pu-238	U-238	U-235	U-233	Am-241	Cm-244
W-24	36,000	2,700	120	<16	26	14	140	10	3.5		6.2	20	260
W-25	48,000	3,800	220	43	77	27	110	22	3.2		8.9	44	650
W-26	26,000	2,200	170	15	32	14	86	10	2.7		4.3	17	240
W-26A[b]	28,000	2,300	170	16	31	14	90	11	2.8		4.5	18	260
W-27	36,000	2,400	210	44	43	20	74	18	1.9		5.4	30	420
W-30	4,200	490	61	5.8	19	7.8	32	3				22	22

[a]Pu-239 data include Pu-240.
[b]W-26A is a combination of 6% W-24, 6% W-25, and 88% W-26.

Source: ORNL/NFW-83/35.

Table A.12. Radiochemical analyses of LLW tank contents for injection SI-8 (nCi/mL)

Tank	Sr-90	Cs-137	Co-60	Eu-152	Eu-154	Eu-155	Pu-239[a]	Pu-238	U-238	U-235	U-233	Am-241	Cm-244
W-24	67,000	23,000	730	880	590	160	110	220	11	<0.26	26	64	580
W-25	460,000	24,000	6,300	1,500	1,400	360	130	370	5.1	<0.26	160	180	7,800
W-26	30,000	19,000	310	120	37	18	31	84	11	0.79	20	29	300
W-27	320,000	15,000	4,500	990	990	220	140	280	1.1	0.53	150	250	5,300
W-30	550,000	23,000	2,600	1,000	980	300	180	540	2.9	0.79	110	350	6,300
W-31	530,000	21,000	2,600	950	970	230	180	540	2.4	<0.26	140	35	6,200

[a] Pu-239 data include Pu-240.

Source: ORNL/NFW-84/12.

Table A.13. Radiochemical analyses of LLW tank contents for injection SI-9 (nCi/mL)

Tank	Sr-90	Cs-137	Co-60	Eu-152	Eu-154	Eu-155	Pu-239[a]	Pu-238	U-238	U-235	U-233	Am-241	Cm-244
W-24	300,000	23,000	1,200	410	450	140	300	320	4.2	0.4	66	460	2,600
W-25	180,000	26,000	660	190	300	93	230	190	2	<0.26	48	200	1,200
W-26	190,000	23,000	790	200	300	140	210	190	2.6	<0.26	50	260	1,400
W-27	120,000	23,000	400	<210	160	50	160	83	4.2	<0.26	31	98	610
W-30	110,000	20,000	520	<200	<140	<87	160	100	1.6	<0.26	33	130	800
W-31	96,000	19,000	640	170	110	53	130	94	3.4	<0.26	33	110	840

[a]Pu-239 data include Pu-240.

Source: ORNL/NFW-84/13.

Table A.14. Radiochemical analyses of LLW tank contents for injection SI-10 (nCi/mL)

Tank	Sr-90	Cs-137	Co-60	Eu-152	Eu-154	Eu-155	Pu-239[a]	Pu-238	U-238	U-235	U-233	Am-241	Cm-244
W-24	37,000	5,500	370	79	120	29	71	130	1	0.53	15	82	820
W-25	66,000	8,500	630	150	240	63	170	480	5.8	<0.26	26	170	1,300
W-26	42,000	5,300	370	74	120	40	71	160	0.66	0.53	16	69	740
W-30	48,000	7,100	50	130	220	69	170	500	4.8	<0.26	18	140	1,300
W-31	110,000	14,000	77	210	220	45	150	260	12	<0.26	37	130	1,400

[a] Pu-239 data include Pu-240.

Source: ORNL/NFW-84/14.

Table A.15. Radiochemical analyses of LLW tank contents for injection ILW-21 (nCi/mL)

Tank	Sr-90	Cs-137	Cs-134	Co-60	Eu-152	Eu-154	Eu-155	Pu-239	Pu-238	U-233	Am-241	Cm-244
W-27	11,000	4,800	110	420	240	140	55	11	9	9.2	29	210
W-28	4,000	1,900	420	79	61	37	16	6.1	8.5	1.3	8.5	48
W-29	7,900	7,400	98	1,000	370	210	95	13	19	3.7	23	220

Source: ORNL/NFW-84/15.

Table A.16. Low-Level Liquid Waste Chemical Character

OLD HYDROFRACTURE FACILITY
(WELL NO. 3)

ILW No. 1	Data not available
ILW No. 2	Data not available
ILW No. 3	Pb, Ba, Ni, Cr: None NO_3 - 0.520 mg/ml
ILW No. 4	Pb, Ba, Cr - None Ni - trace NO_3 - 5.08 mg/ml
ILW No. 5	Pb, Ba, Ni - None Cr - 0.5 mg/ml NO_3 - 40.3 mg/ml
ILW No. 6	Pb, Ba, Ni, Cr - None NO_3 - 65.6 mg/ml
ILW No. 7	Pb, Ba, Ni - None Cr - 0.17 mg/ml
ILW No. 8	Pb, Ba, Ni, Cr - None NO_3 - 51.9 mg/ml
ILW No. 9	Pb, Ba, Ni, Cr - None NO_3 - None reported
ILW No. 10	Pb, Ba, Ni, Cr - None NO_3 - Report misplaced
ILW No. 11	Pb, Ba, Ni, Cr - None NO_3 - Misplaced
ILW No. 12	Pb, Ba, Ni, Cr - None NO_3 - 65.1 mg/ml
ILW No. 13	Pb, Ba, Ni - None Cr - 0.4 mg/ml NO_3 - 17 mg/ml
ILW No. 14	Data misplaced
ILW No. 15	Pb, Ba, Ni - None Cr - 0.02 mg/ml NO_3 - Data misplaced
ILW No. 16	Data misplaced
ILW No. 17	Pb, Ba, Ni, Cr - None NO_3 - 26.6 mg/ml
ILW No. 18	Pb, Ba, Ni - None Cr - 0.04 mg/ml NO_3 - 99 mg/ml

Table A.17. Low-Level Liquid Waste/Gunite Sludge Chemical Characteristics

NEW HYDROFACTURE FACILITY
(WELL NO. 4)

Waste Injection No. 19 (ILW 19)

Storage Tank	Pb, ppm	Ba, ppm	Ni, ppm	Ce, ppm	NO_3, G/L
W24	8	--	1	20	81
W25	50	--	40	8	128
W26	30	--	1	10	83
W27	50	--	10	10	97
W28	30	10	40	10	193
W29	60	9	10	20	403

Sludge Injection No. 1 (SI-1)

Storage Tank	Pb, ppm	Ba, ppm	Ni, ppm	Ce, ppm	NO_3
W24	80	30	50	50	--
W25	50	40	40	40	--
W26	50	20	10	30	--
W27	70	20	30	50	--
W30	100	20	40	50	--

Sludge Injection No. 2 (SI-2)

Storage Tank	Pb, ppm	Ba, ppm	Ni, ppm	Ce, ppm	NO_3
W24	90	20	30	40	--
W25	100	50	20	10	--
W27	60	20	30	30	--
W29	30	30	40	20	--

Sludge Injection No. 3 (SI-3)

Storage Tank	Pb, ppm	Ba, ppm	Ni, ppm	Ce, ppm	NO_3
W24	100	40	20	40	--
W26	40	10	10	20	--

Attachment E

VOLUME AND TYPE OF WATER USED IN FRACTURING AND FLUSHING WELLS

QUANTITY OF WATER INJECTED AT THE OHF

The attached Table (Table A.18) is a summary of operational data for the injections made the OHF. Data were obtained from the injection records and files that were prepared at the time of the injections. The table includes several test injections made with water, seven experimental injections made with synthetic waste with small quantities of radionuclides added, and eighteen operational injections made with actual intermediate level waste (ILW). The figures presented in Table A.18 represent recalculations of quantities of water associated with the injections. These recalculations are felt to be somewhat more accurate than previously reported calculations; there may slight differences in quantities when these data are compared to previously reported data. This interpretation of the records is based, in many cases, on visual examination of logs and charts that represent the operational history of the injections; there is, therefore, some inherent uncertainty in the figures. If the figures deviate significantly from the actual volumes of materials injected, the variations are felt to be on the low side, by no more than 20%.

A distinction is made between waste injected with solids and water injected with solids. The difference is one of mix chemistry; the two fluids required different mix ratios (or had different phase separations at the same mix ratio).

Process water is water that was used to break down the fracture prior to the injection, to flush the well after each halt to the injection that lasted more than a few minutes, and sometimes for clean-up operations (most particularly during expeimental injection 6). During most injections, a volume of about 1,000 gal was injected down the well annulus to force the grout level below the bottom of the tubing string and thereby prevent the tubing string from being cemented to the casing. The water, although listed as process water in most injection summaries, is included as water with solids in this table, because the water would have been well mixed with the injected grout and would have behaved much like the injected waste.

The listed category of phase separated water is, at best, semiquantitative, but estimates of this quantity can be made, based on certain assumptions and observations. The estimate is based on a standardized short-term test done with a synthetic waste under room temperature and pressure. It is known that the phase separation varies with the length of the test, the geometry of the testing equipment, the concentration and chemical species of dissolved salts in the waste, variations in the solids blend, and shear imparted to the grout. Temperature, pressure, and formation fluid chemistry are suspected additional variables. The value given in Column B is based on these tests and the mix ratio during the various injections. The value in Column A is based on the additional assumption that measured phase separation is lower by 3% of the grout volume if the time of the test is extended from 2 to 24 hours.

The bleedback operation was performed at irregular intervals under differing conditions. The bleedback figures represent visual measurements made after injections; in some cases there were no measurements made. The significance of these numbers is uncertain.

The largest volume of "free" water injected at the OHF was the 170,000 gal of water that was injected during the original test injections and during the injection following ILW-3 (Dec. 1967). The second largest volume was "process water" (about 100,000 gal). Phase separated water was estimated to be between 11,000 and 58,000 gal - about 3% of the grout volume injected for the worst case. The quality of this estimate is uncertain.

Table A.18. Summary of Water Quantities
Injected At the OHF
(all quantities in gallons)

Injection	Date	Injected with Solids Waste	Injected with Solids Water	Injected Water	Process Water	Phase* Separated Water A	Phase* Separated Water B	Bleedback
Water	6/63			75,000				36,500
Water	10/63			50,000				23,000
1	2/64		37,300					ND
2	2/64	28,300	500		7,000	600	1,500	ND
3	4/64	33,500	8,200		1,500	0	1,000	ND
4	4/64	37,500	500		3,200	0	0	ND
5	5/64	148,000	1,500		4,500	0	0	ND
6A	5/65	3,400	0		19,800	500	1,000	ND
6B		64,300	1,000		3,360	1,300	3,300	17,000
7	8/65	69,600	16,000		1,500	900	3,500	20,000
ILW-1	12/66	37,400	1,000		1,800	0	0	ND
		26,000	500		3,200	0	0	ND
ILW-2	8/67	81,400	1,000		1,000	0	1,000	ND
		64,400	16,500		1,000	0	2,200	6,000
ILW-3	11/67	77,800	19,000		4,750	4,100	7,100	ND
Water	12/67	0	0	44,700	0	0	0	ND
ILW-4	4/68	86,200	4,200		6,700	500	4,000	ND
ILW-5	10/68	79,000	5,900		3,100	1,000	3,500	ND
ILW-6	6/69	80,000	10,900		1,200	1,500	4,500	ND
ILW-7	9/70	87,000	10,000		1,310	0	2,900	4,000
ILW-8	9/72	72,710	9,400		2,000	0	1,680	1,160
ILW-9	10/72	68,300	8,370		3,800	0	1,620	2,945
ILW-10	11/72	83,760	9,810		870	0	510	1,255
ILW-11	12/72	75,760	7,345		720	0	2,470	12,580
ILW-12	1/75	25,710	5,400		1,530	400	1,300	ND
ILW-13	4/75	81,000	7,000		1,500	0	2,650	ND
ILW-14	6/75	89,000	5,000		3,000	400	3,200	ND
ILW-15	6/77	91,000	6,000		8,500	0	3,000	1,630
ILW-16	11/77	55,200	1,500		4,500	0	1,650	ND
ILW-17	9/78	82,300	3,000		3,400	0	2,060	ND
ILW-18	5/79	83,000	10,400		6,250	0	2,580	450
TOTALS		1,811,540	207,225	169,700	100,990	11,200	58,220	126,520

* See text for explanation of the different assumption involved in calculation of phase separated water for situation A and situation B.

ND = No data available.

QUANTITIES OF WATER INJECTED AT THE NHF

The attached table (Table A.19) is a summary of operational data for the injections made at the NHF. Data were obtained from the injection records and files that were prepared at the time of the injections, and from publications by Tiegs and Weeren (nos. 150-165 in the attached list of references). The table includes three test injections (one made with water), three injections made with ILW, and 10 injections made with resuspended sludge from the Guinte waste storage tanks.

Process water is water that was used to break down the fracture prior to the injection, to flush the well after each halt to the injection that lasted more than a few minutes, and sometimes for clean-up operations. The water that was injected down the annulus during most of the injections at the OHF (to prevent the cementing of the tubing string to the well casing) was not used at the NHF after sludge injection (SI)-3; prior to injection SI-4, the tubing string was cemented permanently in place and the annulus was eliminated.

The listed category of phase separated water is, at best, a semi-quantitative estimate, as before. The estimate is based on à standardized short-term test done with a synthetic waste under room temperature and pressure. It is known that the phase separation varies with the length of the test, the geometry of the testing equipment, the concentration and chemical species of dissolved salts in the waste, variations in the solids blend, and shear imparted to the grout. Temperature, pressure, and formation fluid chemistry are suspected additional variables. The value given in Column B is based on these tests and the mix ratio during the various injections. The value in Column A is based on the additional assumption that measured phase separation is lower by 3% of the grout volume if the time of the test is extended from 2 to 24 hours.

At the NHF, the three categories of "free" water that were injected or resulted from the injection are roughly of the same order of magnitude. Test water totaled 70,000 gal, process water totaled about 100,000 gal, and phase separated water is estimated at between 38,000 and 123,000 gal.

Table A.19. Summary of Water Quantities
Injected At the NHF
(all quantities in gallons)

Injection	Date	Injected with Solids		Injected	Process	Phase* Separated Water		Bleedback
		Waste	Water	Water	Water	A	B	
Site Proof	6/74		100,000	15,000	1,500	0	4,000	
Site Proof II	10/75			55,000				
Facility Test	3/85		55,000		3,800	14,000	16,000	
ILW-19	6/82	160,000	4,000		6,310	0	4,400	6,000
SI-1	8/82	192,000	10,000		25,235	17,306	25,200	5,300
SI-2	9/82	116,000	7,000		3,900	1,200	6,000	2,800
SI-3	10/82	248,000	12,000		7,000	1,500	11,660	10,700
SI-4	4/83	193,000	1,000		10,250	0	7,320	7,680
SI-5	5/83	155,000	4,190		5,500	0	6,120	1,570
ILW-20	6/83	113,400	1,000		3,300	700	5,120	1,100
SI-6	7/83	203,200	3,350		7,575	0	6,600	520
SI-7	8/83	162,900	830		4,890	0	6,090	480
SI-8	10/83	191,900	4,100		3,770	0	6,890	500
SI-9	12/83	190,900	1,000		5,510	0	4,600	240
SI-10	1/84	183,300	1,700		7,675	0	5,480	6,500
ILW-21	1/84	122,000	1,000		4,960	3,000	7,790	(same)
Total		2,231,600	206,170	70,000	101,175	37,700	123,270	43,390

* See text for explanation of the different assumption involved in calculation of phase separated water for situation A and situation B.

ND = No data available.

Attachment F

ANY PROBLEM ASSOCIATED WITH THE INJECTION

A SCHEDULE OF PAST ACCIDENTAL RELEASES

EVENTS AND SITUATIONS INVOLVING UNCONTROLLED CONTAMINANT RELEASE FROM ORNL'S HYDROFRACTURE SITES (MODIFIED FROM ORNL, 1987)

This is a brief summary of specific unusual events and other situations that have (or could have) involved uncontrolled contaminant releases from the hydrofracture operations. No effort is made to offer a detailed discussion of each item; rather a short synopsis of each event or situation is presented. References to more detailed information, where available, are included.

In this discussion, "events" refer to single or multiple times when a release can be documented; these are discussed items 1 through 5. The term "situation" is used to refer to an observation involving a release (or possible release) of contaminants not necessarily tied to any single injection and not necessarily resulting from any single operational or experimental event. The "situations" discussed may reflect release of contaminants resulting from normal disposal or experimental operations over extended periods of time. These are discussed in items 6 through 8.

1. Loss of Radionuclides through Borehole, HF-1

The first test of the hydrofracture process was in 1959. About 20,000 gal of water were mixed with solids and 35 Ci of ^{137}Cs and injected at a depth of 290 ft at the first site. Toward the end of the experiment, a small amount of grout flowed out of an existing well approximately 200 ft away. The injection was stopped; flow ceased. The estimated discharge was less than 0.1 Ci of activity.

2. Diversion of Contaminated Fluids to Waste Pond at the Old Hydrofracture Facility (OHF)

The emergency waste pond at the OHF was constructed to collect major spills of contaminated fluids that might be released during operation. During the 15 years that the facility was in service, several minor spills were discharged to the waste pond. During Experimental Injection 6 in May, 1965, a leak occurred in the high pressure piping in the wellhead cell. About 200 gal of waste grout containing an estimated 2 Ci flowed from the wellhead cell to the waste pond before the leak was detected and the injection halted. Subsequent sampling of the waste pond showed a radionuclide concentration of approximately 1×10^{-5} Ci/gal (0.25 Ci).

3. Release of Radioactivity from Core Drilling Operations

At several times during operations at the OHF and the New Hydrofracture Facility (NHF), wells were drilled through or adjacent to grout sheets that contained radionuclides. Upon at least three occasions, some quantity of radionuclides was detected at the surface, either in the water used in drilling operations or in the formation water that subsequently flowed to the surface.

In late 1964, well S100 at the OHF was drilled through one or more grout sheets. A flow at the surface of about 8 gal/hr was observed. The radionuclide content of this stream was about 17,000 Bq/L of ^{90}Sr.

In 1968, a core hole (S220) was drilled at the OHF to obtain samples of grout sheets and for conversion to an observation well. After drilling, groundwater flowed from the core hole carrying an estimated two curies of ^{90}Sr into the White Oak Creek system. This activity was contained in an estimated 1000 to 1500 gallons of water that flowed out of a fracture at 864-ft depth penetrated by the core hole. A discussion of this event is found in Memorandum to Weinberg (1969).

In 1972 a new S220 observation well was drilled at the OHF. At least one grout sheet was intersected and contaminated drilling water was collected and analyzed. A total of approximately 10 mCi of activity was found.

In 1974 well N200 was drilled at the site of the NHF. This well intersected several grout sheets from injections made at the OHF. The possibility of radionuclide contamination was anticipated and radioactivity was, in fact, found in the drilling water. The contaminated water was collected in a small pit adjacent to the drilling operation; this pit was subsequently backfilled. Samples of the contaminated water were not taken, but a calculation based on survey meter readings suggests a level of activity of about 1.5×10^{-9} Ci/gal.

In 1976, well SE125 was drilled at the site of the NHF. This drilling operation was done subsequent to the "site proof" injection, which was made with a small amount of ^{137}Cs tracer. The drilling operation was monitored and no activity was noted. It is suspected, however, that the level was too low to be detected by the type of monitoring that was used.

In 1985, a core drilling operation was undertaken at the OHF (Joy 3 well). The drilling water from this operation was collected and discharged to the emergency waste pond. Periodic monitoring of the activity of the drilling water indicated that the discharge was probably less than a millicurie.

4. Wells with Breached Casing

There are a small number of cased wells at the OHF and the NHF which have had casings breached by grout during injections. The wells presently contain contaminated groundwater and/or grout. All but one of these wells were constructed as observation wells that fully penetrate the injection zone and were finished into the Rome Formation; at the OHF, the S100, NW100, NE125, and S220-1 wells have been breached.

Typically, breaching occurred during an injection when the well tubing, cemented to the formation both above and below the point of intersection by the grout sheet, was pulled apart by the stresses generated. When this occurred, a significant pressure rise was noted. Such a pressure rise occurred during an experimental injection at the S100 well and during injection ILW-13 at the NE125 well. In the latter case, a wellhead pressure of 900 psi was observed.

Following injection ILW-14 in 1975, well NE125 was logged and found to be unobstructed; the grout sheet responsible for the casing break was noted at 855 ft. During the next winter, the water froze in the top few feet of the well and ruptured the well tubing at the surface. This event was not noticed until later. When the ice plug melted, contaminated water flowed up the well to the surface. No measurement of the fluid volume was made, but it is assumed that the escape of radionuclides was small, because background radioactivity levels were not greatly increased. After this incident, the well was capped. Analysis of the well water showed a level of ^{137}Cs to be 3×10^{-4} Ci/gal. Later, the well was plugged to a depth of about 100 ft by pumping cement grout down the well (the displaced water being forced into the formation).

In addition to the observation wells, the Joy-1 (W300) well at the OHF, which was drilled into the Knox Group, has been breached. It was plugged with grout in the same manner at the NE125 well. Other observation wells at the OHF may also have been breached; assessment of their status is underway. More complete data can be found in de Laguna (1971), Switek and Stow (1986), and Weeren (1974, 1976, 1980).

At the NHF, the NW400 well has been breached, probably during construction. A pressure rise to at least 980 psi was observed after injection SI-6. This pressure subsequently declined to approximately the pressure of the injection well. During injection SI-8, the pressure in NW400 reached 1250 psi. No pressure rise was noted during injection SI-9. A sample collected from this well in January 1985 was found to contain detectable contamination (gross beta $1.0 \times 10^6 \pm 0.1 \times 10^6$ Bq/L) with a pH greater than 11. Also, the E200 well was found to have activity for some 100 ft along the outside of the casing after the SI-5 injection; after the ILW-20 injection this had spread for about 200 ft along the casing. There is no evidence of any further spread of activity.

5. Waste Injections with Low Solids Content

Recent review of NHF operating records indicates that there were times when the injected waste-solids mixture contained less solid material (cement principally) than was intended. Prior to any injection, a desired ratio of solids-to-waste (lbs. solid/gal. waste) was calculated for each tank of waste that was to be disposed; these ratios were determined on the basis of analysis of the waste. Although variable, the ratios were generally in the range of 4 to 8. For the first seven of the injections (ILW-19 and 20; SI-1, 2, 3, 4, and 5), the records indicate that the ratio was slightly to moderately lower than desired (between 50 and 97 percent of the desired value) for injection of approximately 260,000 gallons of waste. The ratio was significantly below the desired level (between 2 and 43 percent) for injection of approximately 45,000 gallons of waste. Approximately 15,000 gallons of waste were injected without solids. Analysis of OHF and NHF injection records is continuing.

6. Recovery of the NHF Injection Well

After the injection well at the NHF was plugged with cement in 1982, it was successfully recovered and injection operations resumed (Weeren et al., 1984). The new well consisted of 2-7/8 inch tubing that was run inside the original well to a depth of approximately 760 feet; at this depth, the tubing followed a sidetrack drill hole that deviated from the original well. The tubing was cemented. Bond logs on the recovered well indicate good cement bonds from 400 to 700 feet and from 780 feet to the bottom of the well. Between 700 and 780 feet, there appears to be a poor bond.

There was difficulty in reslotting the reconstructed well. Three attempts to slot the tubing and adjacent cement were made. The third attempt, using a combination of an explosive perforator and a tubing cutter, was successful in breaching the tubing.

While there is no direct evidence that the well recovery resulted in a compromise of facility safety, the poor cement bond at the point where the new tubing diverges from the original well and the lack of specific knowledge of the nature and configuration of the breach in the new tubing represent potential problems that must be considered in well assessment.

7. Groundwater in the Deep Monitoring Wells

Seven DM wells surround the NHF injection well at a distance of 1000 feet. Three are to the east (DM1) and penetrate the Rome, Pumpkin Valley, and Rutledge strata. Two wells are to the west (DM2) and penetrate the Rome and Pumpkin Valley units. The other two are north-northwest of the NHF (DM3, 3a) and penetrate the Pumpkin Valley and Rutledge Formations. A discussion of these wells and their water chemistry is found in Haase et al. (1985a) and Haase and Stow (1987a).

Groundwater samples were taken from the DM wells in 1986. These samples may contain an unknown amount of residual tap water; because the original three DM wells were open to a column of contaminated water, water samples taken from these wells may reflect some residual contamination. The data indicate that the groundwater is extremely saline (up to almost 200,000 ppm TDS), especially at the DM1 and DM2 sites, and that the greatest amount of contamination occurs in the Pumpkin Valley Shale at the DM1 and DM2 sites. Contents of ^{90}Sr range up to 94,000 Bq/L and gross beta activity is up to 400,000 Bq/L in these wells. The DM3 site appears to be hydrologically isolated from the injection interval as there is no evidence of contamination there. There are significant amounts of ^{90}Sr found in the wells open to the Rome Formation (up to 20,000 Bq/L) and trace amounts in the wells open to the Rutledge Limestone (250 Bq/L). It is unclear exactly what these data mean; the contamination in the Rome Formation may be residual from the time that the wells were open to the Pumpkin Valley Shale, and the ^{90}Sr in the Rutledge Limestone wells could result from cross contamination during sampling.

At present, work is continuing toward development and additional sampling of the DM wells. The wells are to be instrumented with pressure transducers so that data can be obtained on the permeability and head pressures in the three formations.

In 1986, sampling of the Pumpkin Valley well at the DM1 site resulted in release of a small amount (ca. 1 gal) of highly contaminated liquid and solid material due to over-pressurization of the well. This is discussed in Shoemaker et al. (1986).

8. Groundwater in the Rock Cover Wells

Water samples have been taken from the eight rock cover wells that surround the NHF (Switek et al., 1987). These wells penetrate and are completed to the Rogersville-Rutledge strata that overlie the injection interval. Data show low levels (15-20 Bq/L) of ^{90}Sr and detectable amounts of other isotopes (^{137}Cs, ^{60}Co, ^{232}Th) in the groundwater of these wells; nitrate is also present in low (20 to 50 ppm) amounts. The water quality is variable, but TDS up to 100,000 ppm occur. Sampling is continuing.

The mechanism(s) by which injection-related contaminants have entered the overlying strata is unknown. Migration may have been through fractures (either natural or pressure-induced) that connect the injection strata with the overlying confining strata. It is also possible that contaminants could have migrated directly into these overlying strata from the well bore due to loss of integrity of the casing or the grout surrounding the casing. This could have resulted from a poor cement bond or from pressures induced during the "slotting" of the well after recovery. Sampling is under way to determine if contaminants also exist in the groundwaters of the OHF rock cover wells.

Volume 1, Part 2—RFA SUMMARY SHEETS

The permit for operating the Hazardous Waste Storage Facility, 7652 (TN1 890 090 003) requires that DOE submit within 180 days specific information about each of the solid waste management units (SWMUs) identified within the Oak Ridge Reservation boundary. This RCRA Facilities Assessment (RFA) has been limited to the SWMUs that are related to operations of the Oak Ridge National Laboratory (ORNL). Separate reports will be submitted for the other DOE facilities at Oak Ridge. EPA has requested that the following information be supplied for each SWMU:

a) Type of unit;
b) Location of each unit on a topographic map of appropriate scale;
c) General dimensions and capacities;
d) Function of unit;
e) Dates that the unit was operated;
f) Description of the wastes that were placed in the unit;
g) Either—a description of any known, suspected, or presumed releases or spills of hazardous waste or hazardous constituents (per Appendix VIII of 40 CFR Part 261), which includes any existing data and analyses of groundwater, soil, surface water, and air quality;
h) Or—a description of technical studies and results and other information that convincingly demonstrates that a release has not occurred or demonstrates that a release is highly improbable.

This volume of the RFA includes the information developed by ORNL in response to EPA's request [with the exception of item b (location of each unit on a topographic map of appropriate scale), which is included as Volume 2]. Because of the large number of sites identified at ORNL (approximately 250), ORNL has grouped the SWMUs into 20 Waste Area Groupings (WAGs) based on hydrologic, geologic, and geographic considerations (Part 1, Sect. 1.2). In order to provide the requested information in a manageable package, a summary format has been used to supply the information requested [Part 1 contains additional details and references for backup to the summary sheets; Part 1 also summarizes the recommended action for each WAG based on the information in the summary sheets and preliminary contaminant surveys (Table 4.2)]. To simplify organization of the information, the summary sheets have been compiled using a unique SWMU number (the first digit is the WAG number, and the following digits are the identifiers for the SWMUs (e.g., 1.1 is the first SWMU in WAG 1). Table 1 in Volume 1, Part 1 lists and names all of the SWMUs described in the summary sheets.

ORNL grid coordinates for each of the SWMUs are included in the RFA summary sheets. Because some of the SWMUs cover large areas (e.g., the solid waste storage areas and ponds), coordinates for these SWMUs are located at the centroid (central point) of the unit. In the case of leak/spill sites, no approach was found that would allow determination of exact coordinates for each SWMU. The descriptive material included in the summary sheets represents the best information available on the location of the SWMU.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.1

SWMU Name: Mercury Contaminated Soil—(3503)

Location of Unit: The contaminated soil is that surrounding Building 3503 on the corner of White Oak Avenue and Southside (main ORNL complex). ORNL grid coordinates are N 21,620 and E 31,400.

General Dimensions and Capacities: Data not available.

Function of the SWMU: Building 3503 was used in the PUREX spent fuel reprocessing program.

Dates of Operation: Site was in operation in the period 1950-1960.

Waste Characteristics: Major contaminant is liquid mercury.

Release Data: During the 1950s and early 1960s, substantial quantities of mercury were used in the spent fuel reprocessing program known as PUREX. No information exists on the amount of possible losses. Analyses of soil samples collected from various locations around Building 3503 ranged from 0.8 to 25 ppm.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.2

SWMU Name: Mercury Contaminated Soil—(3592)

Location of Unit: The contaminated soil is that surrounding Building 3592 on the west corner of White Oak Avenue and Fourth Street (main ORNL complex). ORNL grid coordinates are N 21,750 and E 31,425.

General Dimensions and Capacities: Data not available.

Function of the SWMU: The building around which the soil is located was used in component development activities for a lithium separation process.

Dates of Operation: Site was in operation in the 1950s.

Waste Characteristics: Main contaminant is liquid mercury.

Release Data: During 1956, equipment development work in Building 3592 was performed in support of the research activity in Building 4501 on lithium separation. Over a period of about two months, more than 60,000 lb of mercury was used. No estimate of the amounts lost through spills is available; however, operating personnel have estimated a total of 2,000 to 3,000 lb was lost due to spills and leaks. The facility is currently being used as a coal conversion pilot plant. Analyses of soil samples taken in 1983 from various locations around Building 3592 showed mercury concentrations ranging from 4.1 to 320 ppm.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.3

SWMU Name: Mercury Contaminated Soil—(4501)

Location of Unit: The contaminated soil is that surrounding Building 4501 on the southeast corner of Fifth Street and Central Avenue. ORNL grid coordinates are N 21,980 and E 32,090.

General Dimensions and Capacities: Data not available.

Function of the SWMU: The building around which the soil is located was used in a small pilot plant supporting the lithium separation process.

Dates of Operation: Site was in operation April to November 1954.

Waste Characteristics: Main contaminant is liquid mercury.

Release Data: At Building 4501, ton quantities of mercury were used for about six months during 1954 for the operation of a small pilot plant for lithium separation (OREX process). Spills did occur. During a spill the visible mercury was cleaned up, but the concrete floor had cracks, and the mercury was able to escape in this manner. The building is currently used as a high-level radiochemistry laboratory. Analyses of soil samples collected from various locations in 1983 indicated that soils around Building 4501 had concentrations of mercury ranging from 0.05 to 465 ppm.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.4

SWMU Name: Mercury Contaminated Soil—(4508)

Location of Unit: ORNL grid coordinates are N 21,580 and E 32,030.

General Dimensions and Capacities: Data not available.

Function of the SWMU: General research and development activities.

Dates of Operation: Data not available.

Waste Characteristics: Contaminant of concern is liquid mercury.

Release Data: Although research activities in Building 4508 are reported to have used inventories of less than 100 lb of mercury, there is no information available to indicate that a mercury spill has occurred.

Verification of Release: No soil sampling has been conducted around Building 4508. To establish information on releases it is suggested that a soil sampling program similar to that conducted around Building 4501 be initiated.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5a

SWMU Name: LLW Lines and Leak Sites—South of Building 3020

Location of Unit: Site is located due south of Building 3020.

General Dimensions and Capacities: SWMU 1.5a is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The Main Plant Area LLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents.

Dates of Operation: Site leak date: mid 1970s.

Waste Characteristics: The volume and composition of waste handled by the LLW collection and transfer system have varied along with the R&D activities during the operating history of the Laboratory. No routine effort was made to determine the composition of the waste streams. Most sources generate dilute LLW at the mCi/gal level, although wastes containing up to 20 Ci/gal were produced in certain operations and diluted to around 0.05 Ci/gal before entering the collection system. It has been estimated that the average activity of LLW is about 30 mCi/gal. The major radionuclides present are Sr-90, Cs-137, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes are also present. Wastes are generally nitrate solutions, although acid chlorides or other corrosive wastes were also generated. Wastes were normally neutralized prior to evaporation and tank storage.

Release Data: Leak site contains Pu, Sr, Cs, and other radionuclides; concentrations are unknown. The line served Building 3108, and leaks occurred at the vent stack and the valve pit areas. The initial leak occurred in the mid 1970s when a site glass in the header froze and broke. Later a restriction downline caused a backup to occur with overflow at both locations. Leakage from this site, and from overflows that have occurred, has also contaminated the storm drainage system north of Building 3074 from east to west.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5b

SWMU Name: LLW Lines and Leak Sites—East of the Building 3020 Stack

Location of Unit: The site is located east of the Building 3020 Stack.

General Dimensions and Capacities: SWMU 1.5b is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The Main Plant Area LLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents.

Dates of Operation: Site leak date: about 1960.

Waste Characteristics: Wastes handled in the collection system were routinely generated Laboratory LLW. Major radionuclides were Sr-90, Cs-137, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams from certain sources. (See waste description entry for SWMU 1.5a for additional details.)

Release Data: The leak is believed to have occurred some 25 years ago, possibly from exhaust-gas duct leakage. A 1970 contamination survey of the area showed 20 mR/h on top soil and alpha readings at 10 mR/h. Data on the composition of the contaminants are not given. Most of the contamination is in the soil and concrete pad.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5c

SWMU Name: LLW Lines and Leak Sites—West of Building 3082

Location of Unit: The site is located west of Building 3082.

General Dimensions and Capacities: SWMU 1.5c is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The Main Plant Area LLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents.

Dates of Operation: Site leak date: about 1960.

Waste Characteristics: Wastes handled in the collection system were routinely generated Laboratory LLW. Major radionuclides were Sr-90, Cs-137, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams from certain sources. (See waste description entry for SWMU 1.5a for additional details.)

Release Data: This leak was thought to have occurred over 25 years ago. Readings in the area were 1–2 mR/h in surveys during the 1970s. The contamination was most probably caused by off-gas duct leakage or an LLW line leak; however, no documentation is known to exist regarding the source. This site is also close to the location of an old plutonium facility that was housed in a wooden frame building. The building was destroyed early in the history of ORNL and is not listed on current maps. The area of contamination may or may not be affected by the past presence of this building. Data on contaminant composition are not available.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5d

SWMU Name: LLW Lines and Leak Sites—North of Building 3019

Location of Unit: The site is located north of Building 3019 (West of the Building 3074/3019 gate).

General Dimensions and Capacities: SWMU 1.5d is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The Main Plant Area LLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents.

Dates of Operation: Site leak discovered: February 1985.

Waste Characteristics: Wastes handled in the collection system were routinely generated Laboratory LLW. Major radionuclides were Sr-90, Cs-137, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams from certain sources. (See waste description entry for SWMU 1.5a for additional details.)

Release Data: A low-level waste line leak occurred in a concrete encased vitrified clay (Chemware) line that served the manipulator shop upstream and the Building 3020 stack; the line/header had deteriorated over time. There is no real estimate of the period of leakage; however, the leak was discovered in February 1985 after Sr-90 was found in the sewer system at higher than normal levels. The leak occurred at the T in the line. Upon excavation, a cavern was found in the area. Excavation was provided for access to the leak; no attempt was made to remove all the contaminated soil in the area. The contaminated earth removed was disposed of, and the excavation was backfilled with clean earth after the north and south lines into the T were capped.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5e

SWMU Name: LLW Lines and Leak Sites—Southwest Corner of Building 3019

Location of Unit: The site is located at the southwest corner of Building 3019.

General Dimensions and Capacities: SWMU 1.5e is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The Main Plant Area LLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents.

Dates of Operation: Site leak date: 1970s (last occurring in 1978).

Waste Characteristics: Wastes handled in the collection system were routinely generated Laboratory LLW. Major radionuclides were Sr-90, Cs-137, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams from certain sources. (See waste description entry for SWMU 1.5a for additional details.)

Release Data: This leak is located in the LLW line draining the analytical cells in Building 3019. After the last occurrence in 1978, the leak was corrected; soil was removed during the corrective action only to make repairs. Samples of the soil removed had radiation levels of 100 mR/h. The line was known to contain Sr-90, Co-60, mixed fission products, and alpha emitters.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5f

SWMU Name: LLW Lines and Leak Sites—Between W-5 and WC-19

Location of Unit: The site is between W-5 and WC-19, 30 ft (9 m) east of the northeast corner of Building 3025 and 45 ft (14 m) from the south edge of the Hillside area.

General Dimensions and Capacities: SWMU 1.5f is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The Main Plant Area LLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks.

Dates of Operation: Site leak date: October 16, 1972.

Waste Characteristics: Wastes handled in the collection system were Laboratory LLW. Major radionuclides detected were Cd-115, Ce-141, Ba-140, Nb-95 (all known contaminants in ORR coolant) and various rare earths.

Release Data: Radiation readings of 700 mR/h were noted a the steam leak area (in earth around leak), and readings of 20 to 600 mR/h were found in mud in a half-round drain tile extending eastward to a storm sewer catch basin, in the general area of the leak.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5g

SWMU Name: LLW Lines and Leak Sites—Underneath Building 3047

Location of Unit: The site is the area underneath Building 3047.

General Dimensions and Capacities: SWMU 1.5g is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The Main Plant Area LLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents.

Dates of Operation: Site leak date: undetermined.

Waste Characteristics: Wastes handled in the collection system were routinely generated Laboratory LLW. Major radionuclides were Sr-90, Cs-137, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams from certain sources. (See waste description entry for SWMU 1.5a for additional details.)

Release Data: This site has suspect underground contamination due to its history of operations. Few documented cases were found in Laboratory records; however, intralaboratory correspondence documents the presence of contamination in this area. The main contaminant is Sr-90.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5h

SWMU Name: LLW Lines and Leak Sites—General Isotopes Area (3037, 3038, 3034)

Location of Unit: The General Isotopes Area is located around buildings 3034, 3037, and 3038.

General Dimensions and Capacities: SWMU 1.5h is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The Main Plant Area LLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents.

Dates of Operation: Site leak date: 1950s and 1960s (multiple events).

Waste Characteristics: Wastes handled in the collection system were routinely generated Laboratory LLW. Major radionuclides were Sr-90, Cs-137, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams from certain sources. (See waste description entry for SWMU 1.5a for additional details.)

Release Data: This general area is contaminated with Cs-137, Co-60, Ru-106, Sr-90, and possibly mercury. The amount of radioactivity discharged into the process waste system from this source has been listed as 4.3 Ci. Some mention of Pm-147 and Ce leakage has also been reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5i

SWMU Name: LLW Lines and Leak Sites—Building 3092 Area

Location of Unit: Site is located around Building 3092.

General Dimensions and Capacities: SWMU 1.5i is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: Not applicable—spill site.

Dates of Operation: Site leak date: unknown.

Waste Characteristics: No information available.

Release Data: This site was included in a tabulation of contaminated areas dated January 31, 1972. The writeup stated that a spill occurred onto grass alongside of Building 3092. The grass and soil was dug up and replaced with clean dirt.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5j

SWMU Name: LLW Lines and Leak Sites—Underneath Building 3026

Location of Unit: The site is located beneath and around Building 3026.

General Dimensions and Capacities: SWMU 1.5j is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: Not applicable—spill site.

Dates of Operation: Site leak date: 1950s and 1960s.

Waste Characteristics: No information available.

Release Data: Because of its long use, Building 3026 area contamination may include isotopes of uranium, fission products, and transuranics. Numerous leaks have been reported during that time interval. Few quantitative data were found; however, the site is suspected to have contamination based on references from Operations Division reports.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5k

SWMU Name: LLW Lines and Leak Sites—Between WC-1 and W-5

Location of Unit: The site is located in the Building 3024 area, between WC-1 and W-5.

General Dimensions and Capacities: SWMU 1.5k is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The Main Plant Area LLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents.

Dates of Operation: Site leak date: 1953–1979.

Waste Characteristics: Wastes handled in the collection system were routinely generated Laboratory LLW. Major radionuclides were Sr-90, Cs-137, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams from certain sources. (See waste description entry for SWMU 1.5a for additional details.)

Release Data: The site is reported to consist of a break in the transfer line between waste tanks WC-1 and W-5. It is probable that a number of leaks have occurred in this area.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5I

SWMU Name: LLW Lines and Leak Sites—ORR Water Line (Building 3085)

Location of Unit: Excavation and repair of the site extended from #1 pump cell to approximately 80 ft (24 m) north of Building 3085 to the "Y" pit.

General Dimensions and Capacities: The leak was in the Oak Ridge Research Reactor (ORR) 24-in. (61-cm) waterline.

Function of the SWMU: The waterline transports cooling water from the ORR to its heat exchangers.

Dates of Operation: Site leak date: 1975.

Waste Characteristics: Water is the primary coolant for the ORR and contains activation products.

Release Data: Radiation levels were encountered to 2 R/h, and transferable contamination, which resulted from the leaks, was found up to 100 mR/h. The contamination was primarily Cd-115 with traces of Na-24, Sc-45, Cr-51, Zr-95, Cs-137, and Cs-141. All contaminated soil was transferred to SWSA 6. Following repair of the leaks, a 6-in. (15-cm) concrete wall was poured on each side of the pipe and covered with 3/8-in. (0.5-cm) aluminum treadplate.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5m

SWMU Name: LLW Lines and Leak Sites Building 3028

Location of Unit: Leak site is probably in an LLW line serving Building 3028 and Building 3047.

General Dimensions and Capacities: SWMU 1.5m is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The Main Plant Area LLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents.

Dates of Operation: Leak reported: March 1985.

Waste Characteristics: No information available.

Release Data: This leak was discovered in the LLW line leading from Building 3028 during excavation for the construction of condensate traps in the LLW lines serving buildings 3028 and 3047. After uncovering the 6-in.-diam stainless steel pipe, radiation levels of over 200 R/h were measured in contaminated soil at the contact with the pipe. Analysis of the contaminated soil revealed the presence of certain short-lived isotopes that could only have originated from the gadolinium process in Building 3047. The leaking section of pipe was abandoned and new lines installed to bypass the contaminated area. Contaminated soil from the excavation was removed, and the hole was backfilled with clean soil.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5n

SWMU Name: LLW Lines and Leak Sites—East of Building 2531

Location of Unit: The site is found east of Building 2531 in the area south of Central Avenue in the ORNL main complex.

General Dimensions and Capacities: SWMU 1.5n is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The Main Plant Area LLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents.

Dates of Operation: Site leak date: December 1971 and April 1978.

Waste Characteristics: Wastes handled in the collection system were routinely generated Laboratory LLW. Major radionuclides were Sr-90, Cs-137, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams from certain sources. (See waste description entry for SWMU 1.5a for additional details.)

Release Data: The abandoned 2-in. (5-cm) cast-iron waste transfer line was broken by a communications construction group during trenching operations. The line was repaired with an Adam's clamp. Another leak was the result of an underground crossover that developed between the process waste line and a storm sewer.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5o

SWMU Name: LLW Lines and Leak Sites—Underneath Building 3515

Location of Unit: The site is located underneath Building 3515 south of Central Avenue in the ORNL main complex.

General Dimensions and Capacities: SWMU 1.5o is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: Not applicable—spill site.

Dates of Operation: Date site contaminated: August 1951.

Waste Characteristics: No information available.

Release Data: The area under Building 3515 is contaminated as a result of past use as a radioactive chemical processing plant. Radioactive material leaking into the condensate line was carried to the concrete drain pipe leading to White Oak Creek. A leaking joint in the concrete pipe about 100 ft (30 m) south of Building 3515 resulted in spreading contamination to a ditch and surrounding area. The contaminated earth in and near the ditch was removed. Cell floor and pan drains were diverted to W-12 hot waste storage. The concrete gallery floor was decontaminated by chipping. The entire floor was painted before operation was resumed.

A pipe trench, which was dug at the southeast corner of the South Tank Farm, became highly contaminated when a weld in a process tank jacket failed in Building 3515; the water from the jacket was piped to the storm sewer located in this area. This area has been cleaned up by removing the contaminated soil.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5p

SWMU Name: LLW Lines and Leak Sites—Building 3525 to a Sump

Location of Unit: Contamination at the site is a sump in the area of Building 3525 south of Central Avenue in the ORNL main complex.

General Dimensions and Capacities: SWMU 1.5p is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The Main Plant Area LLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents.

Dates of Operation: Site leak date: prior to January 1972.

Waste Characteristics: Wastes handled in the collection system were routinely generated Laboratory LLW. Major radionuclides were Sr-90, Cs-137, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams from certain sources. (See waste description entry for SWMU 1.5a for additional details.)

Release Data: In this approximate area, severe contamination may be found resulting from leaking LLW lines discharging water into a ventilation duct, which in turn feeds a sump located at this point.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5q

SWMU Name: LLW Lines and Leak Sites—Underneath Building 3550

Location of Unit: The site is designated as the area around and underneath Building 3550 south of Central Avenue in the ORNL main complex.

General Dimensions and Capacities: SWMU 1.5q is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The Main Plant Area LLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents.

Dates of Operation: Date leak: Prior to January 1972.

Waste Characteristics: Wastes handled in the collection system were routinely generated Laboratory LLW. Major radionuclides were Sr-90, Cs-137, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams from certain sources. (See waste description entry for SWMU 1.5a for additional details.)

Release Data: Ground beneath the former semi-works ports of Building 3550 may be contaminated. Part of this building was demolished, and all material from the building was removed for disposal.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5r

SWMU Name: LLW Lines and Leak Sites—Sewer Near Building 3500

Location of Unit: The site is south of Central Avenue in the ORNL main complex. It is the 3500 Block area of the sanitary sewer system.

General Dimensions and Capacities: SWMU 1.5r is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The Main Plant Area LLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents.

Dates of Operation: Site contamination date: 1958–1980.

Waste Characteristics: Wastes handled in the collection system were routinely generated Laboratory LLW. Major radionuclides were Sr-90, Cs-137, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams from certain sources. (See waste description entry for SWMU 1.5a for additional details.)

Release Data: Contamination of the 3500 Block area of the sanitary sewer system has resulted from inleakage of various LLW sources, such as Building 3026 and other radioisotope areas. The leaks were active solutions of radioisotopes; composition data are not available.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5s

SWMU Name: LLW Lines and Leak Sites—Abandoned Line Central Avenue Area

Location of Unit: The site is located near Building 3026 and north of Central Avenue in the ORNL main complex.

General Dimensions and Capacities: SWMU 1.5s is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The Main Plant Area LLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents.

Dates of Operation: Date site indicated as contaminated: January 31, 1972.

Waste Characteristics: Wastes handled in the collection system were routinely generated Laboratory LLW. Major radionuclides were Sr-90, Cs-137, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams from certain sources. (See waste description entry for SWMU 1.5a for additional details.)

Release Data: The activity in the storm sewer discharge seeped into an abandoned section of clay pipe from contaminated soil. The activity in the sanitary sewer came mainly from inleakage under Central Avenue in front of Building 3026, although some traces of activity have also been found in the sewer running east to west on the north side of Building 4508. The leak into the sewer in front of Building 3026 was undoubtedly from earth contaminated by an old line that leaked and was taken out of service years ago.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5t

SWMU Name: LLW Lines and Leak Sites—Building 4508, North

Location of Unit: The site is located just north of Building 4508 in the area south of Central Avenue in the ORNL main complex.

General Dimensions and Capacities: SWMU 1.5t is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The Main Plant Area LLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents.

Dates of Operation: Date site indicated as contaminated: January 31, 1972.

Waste Characteristics: Wastes handled in the collection system were routinely generated Laboratory LLW. Major radionuclides were Sr-90, Cs-137, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams from certain sources. (See waste description entry for SWMU 1.5a for additional details.)

Release Data: The ground north of Building 4508 was contaminated by Sr-90. An unsuccessful attempt was made in 1970 to determine the source of this contamination. This area has since been paved.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5u

SWMU Name: LLW Lines and Leak Sites—Building 3518, West

Location of Unit: The site is north of Building 3544 and Building 3518, west of the Equalization Basin (3524), and south of White Oak Avenue.

General Dimensions and Capacities: SWMU 1.5u is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The Process Waste Treatment Plant treats the very low-level liquid wastes that are termed process waste (normally does not contain radioactivity but could be contaminated as the result of equipment failure or human error).

Dates of Operation: Date leak discovered: 1978.

Waste Characteristics: The material was a concentrated strip solution from the Process Waste Treatment Plant (PWTP) that was contaminated with low-level amounts of Sr-90 and Cs-137.

Release Data: The spill of less than 100 gal (378 L) required the removal of about 6 cubic yards of contaminated dirt. The line was punctured by an air hammer bit during the installation of a waste transfer line from Building 1504.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5v

SWMU Name: LLW Lines and Leak Sites—Northwest of Solid Waste Storage Area (SWSA) 1

Location of Unit: The site is located just northwest of SWSA 1.

General Dimensions and Capacities: SWMU 1.5v is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The low-level liquid waste (LLW) system at ORNL was designed to collect radioactive waste solutions from the various sources at the Laboratory. Virtually all of the buildings within the Laboratory that were involved in radionuclide operations were served by this system.

Dates of Operation: Date site indicated as contaminated: January 31, 1972.

Waste Characteristics: Wastes handled in the collection system were routinely generated Laboratory LLW. Major radionuclides were Sr-90, Cs-137, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams from certain sources. (See waste description entry for SWMU 1.5a for additional details.)

Release Data: A break that occurred in the LLW transfer line northwest of SWSA 1 permitted leakage into White Oak Creek.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.5w

SWMU Name: LLW Lines and Leak Sites—Building of 3503, Ground Contamination

Location of Unit: The site is located at the Solvent Column Pilot Plant, Building 3503, south of White Oak Avenue in the ORNL main complex.

General Dimensions and Capacities: SWMU 1.5w is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The Main Plant Area LLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents.

Dates of Operation: Date site contaminated: 1954.

Waste Characteristics: Wastes handled in the collection system were routinely generated Laboratory LLW. Major radionuclides were Sr-90, Cs-137, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams from certain sources. (See waste description entry for SWMU 1.5a for additional details.)

Release Data: Much of the activity was the result of a series of operating accidents at the Solvent Column Pilot Plant (Building 3503). One of the accidents was the leaking of a discharge line from a waste tank. The other was a spill at the thorium waste tank that overflowed and contaminated the surrounding ground and groundwater. The groundwater surrounding these tanks is pumped to the equalization basin.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.6

SWMU Name: Contaminated Surfaces and Soil from 1959 Explosion in Building 3019 Cell

Location of Unit: Building 3019 is located on the northeast corner of Hillside Avenue and Third Street in the ORNL complex in Bethel Valley. The approximate ORNL grid coordinates are N 22,530, E 31,100.

General Dimensions and Capacities: Unavailable.

Function of the SWMU: Building 3019 houses the Radiochemical Processing Pilot Plant.

Dates of Operation: Pilot plant (3019) was constructed in 1943.
Site was contaminated in 1959.

Waste Characteristics: Plutonium was released from the processing cell as an aerosol of fine particles of plutonium oxide contaminating Building 3019, the Graphite Reactor (Building 3001), and nearby streets and building surfaces. The Pu-239 inventory of the contaminated surfaces and soil was calculated to be less than 0.047 Ci.

Release Data: In 1959, a non-nuclear explosion in a shielded cell in the Radiochemical Processing Pilot Plant (3019-A) contaminated Building 3019, the Graphite Reactor (3001), and nearby streets and building surfaces. All contaminated areas were decontaminated, or were covered with paint to shield alpha radioactivity. Some soil was removed from contaminated areas; however, all contaminated soil was not removed.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0 WAG Name: Main Plant Area

SWMU ID Number: 1.7 SWMU Name: Contamination at Base of 3019 Stack

Location of Unit: The area of concern is now referred to as the "3019 Hot Bank." This area is located south of Building 3020 and west of Building 3091 (the building that houses the 3019 stack). The approximate ORNL grid coordinates are N 22,680 and E 30,995.

General Dimensions and Capacities: This is the area around the base of the 3019 stack.

Function of the SWMU: Data unavailable.

Dates of Operation: Site contaminated: 1950s and 1960s.

Waste Characteristics: Soil analyses taken in August 1985 of the 3019 bank showed elevated levels of gross alpha and gross beta, Pu, Am, Cm, Cs, and Co.

Release Data: Building 3019 stack emissions may have contributed to the overall contamination of the bank; however, other contributors to contamination in this area include low-level waste line leak sites located in this area. The 3019 bank has been a reported source of surface and surface water contamination.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.8

SWMU Name: Graphite Reactor Storage Canal Overflow—(3001/3019)

Location of Unit: The canal runs under buildings 3001 and 3019 on Hillside Avenue. The approximate ORNL coordinates are N 22,530 and E 31,100.

General Dimensions and Capacities: The canal is 7.0 ft (2.1 m) wide, 11.5 ft (3.5 m) deep, and 101.0 ft (31.0 m) long. The canal is covered with a concrete structure and soil.

Function of the SWMU: The Oak Ridge Graphite Reactor fuel storage canal connected the fuel discharge pit to the adjoining chemical-processing building (3019). It is currently used for storage of radioisotopes but was originally used for storage and handling of irradiated fuel and radioisotope targets.

Dates of Operation: Site commissioned: 1943.
Site is still in use.

Waste Characteristics: Stored isotopes include Co-60 and Sr-90. The canal also contains ~1 m^3 of contaminated sludge containing Pu-239 (primarily), Pu-238, Am-241, and Cm-244.

Release Data: The canal has bare concrete walls that have absorbed long-lived fission products and Co-60, and probably TRU. Results of radiation surveys were reported in 1984. No leakage from the canal has been reported. One ORNL engineering drawing contains the notation "overflow"; however, no documentation of this event can be found.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.9

SWMU Name: Oak Ridge Research Reactor Decay Tank Rupture Site—(3087)

Location of Unit: The Oak Ridge Research Reactor Decay Tank is located near Building 3042 in the ORNL main complex. The ORNL grid coordinates are N 22,738 and E 31,660.

General Dimensions and Capacities: Capacity of the tank is 11,000 gal (41,635 L).

Function of the SWMU: The tank contains water coolant.

Dates of Operation: Site commissioned: unknown.
Site leaked: 1974.

Waste Characteristics: Isotopes present in the primary coolant water include Na-24, Sr-90, I-131, Ru-106, and Cs-137. There is no available information concerning the quantity of radionuclides leaked to surrounding soil.

Release Data: The tank developed a leak in 1974 that released primary coolant water at the rate of 1.5 gal/min (5.7 L/min). Surveys detected radiation levels up to 2 R/h. There is no available information concerning the quantity of radionuclides leaked to surrounding soil. Cleanup efforts (in April 1974) included removing, cleaning, and rewelding the tank, but documentation of the removal of contaminated soil is lacking.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.10

SWMU Name: Storage Pads—(3503 and 3504)

Location of Unit: This storage pad is located southwest of Building 3503. The ORNL grid coordinates are N 21,520 and E 31,310.

General Dimensions and Capacities: The concrete pad is approximately 39 × 29 ft (15 × 12 m). A portion of the pad has a covering over two areas that are used for storage of barrels and surplus miscellaneous equipment and crates. The two areas have metal tray floorings.

Function of the SWMU: The unit has been used as storage for containers of radionuclide-contaminated materials, scrap material, and metal recovery operations equipment.

Dates of Operation: Site commissioned: late 1950s.
Site is still in use.

Waste Characteristics: The major radioactivity present is believed to be associated with the storage of U-233 and Pu-239. Prior to the addition of a 4-in. layer of concrete to the pad in the 1970s, the surface contamination was estimated at 100,000 dpm 100 sq cm. No alpha radioactivity was detected during the latest survey.

Release Data: Although the major radioactivity beneath the top layer of concrete is believed to be U-238 and Pu-239, the source of radioactivity in the areas surrounding the pad and the metal trays has not been determined. The pad is located just north of White Oak Creek, and migration of contaminants by runoff is possible.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.11

SWMU Name: Decommissioned Waste Holding Basin—(3512)

Location of Unit: This site is the location of the present parking lot for Building 3544. ORNL grid coordinates are N 21,370 and E 30,780.

General Dimensions and Capacities: 3512 was an earthen-diked pond approximately 40 × 40 ft (12 × 12 m), with a holding capacity of 30,000 gal (113,000 L).

Function of the SWMU: Much of the pond was dug up and backfilled with gravel during construction of the Process Waste Water Treatment Plant (3544). Used as a retention pond for storage tank drainage from 1944 to 1950, it is presumed to have handled hazardous substances.

Dates of Operation: Site commissioned: early 1940s.
Site taken out of service: 1957.

Waste Characteristics: Information concerning hydrogeologic and waste characteristics is scare. Substantial quantities of process waste water that probably contained various radionuclides were discharged to the pond. During the late 1940s as much as 1,300 gal (950 L) of isobutyl methyl ketone were discharged to the pond.

Release Data: Total radioactive contamination has been estimated at less than 10 Ci.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.12

SWMU Name: Waste Holding Basin—(3513)

Location of Unit: Settling Basin 3513 is located in the settling basin area in the southwest corner of the ORNL complex in Bethel Valley, overlying the limestone bedrock of the Chickamauga Group. It is approximately 110 ft (33 m) north of White Oak Creek between Building 3544 and the two 190 Process Waste ponds (3539 and 3540). ORNL grid coordinates are N 21,320 and E 31,100.

General Dimensions and Capacities: This unlined surface basin has been taken out of service but remains uncovered. Dimensions are approximately 220 × 220 ft (67 × 67 m), sloping 200 × 200 ft (61 × 61 m) at the bottom with a normal storage capacity of about 1,880,000 gal (7,116,574 L) of water and sediment.

Function of the SWMU: The impoundment was constructed to act as a settling basin for wastes prior to their discharge into White Oak Creek. It was in operation until 1976 when a new process waste treatment plant began operation.

Dates of Operation: Site commissioned: 1944.
Site inactive: 1976.

Waste Characteristics: Wastes to the basin included supernatant from the gunite tanks until 1949. Additional wastes were from laboratory floor and sink drains, chemical process cells, and cooling water from the graphite reactor. Following construction of the Process Waste Treatment Plant, the basin served as a settling basin for treated effluent prior to release to WOC.

At the time of a September 1983 survey the sediment layer ranged from 1.6 ft to 3.3 ft (0.5 m to 1 m) thick and contained approximately 71, 428 cubic ft (2,000 cubic m) of residue. In addition to Cs-137 and Sr-90, the sediment contained measurable quantities of Co-60, Eu-154, Pu-238, Pu-239, Am-241, and Cm-244. In an earlier study, total inventory of radionuclides was estimated to be 235 Ci, with Cs and Sr accounting for 84% and 13%, respectively. The remaining radionuclides 3% of the total inventory. EP Toxicity analysis of the sediment showed that it was toxic by characteristic because of elevated levels of mercury.

Release Data: From four quarters of groundwater monitoring, it was observed that concentrations of Fe, chlorides, Mn, Zn, total organic carbon, and gross alpha and beta activity in downgradient wells were significantly greater than measurements in groundwater taken from monitoring wells upgradient from the impoundment.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.13

SWMU Name: Equalization Basin—(3524)

Location of Unit: The Equalization Basin (3524) is in the southcentral portion of the Bethel Valley ORNL complex. This pond is on the southeast corner of the intersection of Third Street and White Oak Avenue. ORNL grid coordinates are N 21,550 and E 30,935.

General Dimensions and Capacities: This unlined basin measures 95 × 250 ft (29 × 76 m) with a maximum depth of 6.5 ft (2 m). It is capable of storing 1,000,000 gal (3,785,000 L) of liquids. Elevation at the top of the berm is ~787 ft (240 m). The present Basin 3524 was constructed at the site of two former basins.

Function of the SWMU: Process wastes from the ORNL building complexes are delivered to the Equalization Basin prior to discharge to the process waste treatment facility (Building 3544). Basin 3524 normally receives process wastes from the Bethel Valley ORNL facility, but on occasion some waste from the Melton Valley facilities is received.

Dates of Operation: The site operated from 1945 to present.

Waste Characteristics: Sludge samples were collected from the Equalization Basin (3524) during January and February 1986. Analysis of sludge by the EP leach test revealed no toxicity characteristics. Benzene, chloroform, and methylene choride were three non-EP-TOX limited volatile organics present, with average concentrations of 6.8, 3.6, and 6.4 μg/L, respectively. In 1984, analysis of the sludge indicated an inventory of 150 Ci. Of this total, 100 Ci was Cs-137, 30 Ci was Sr-90, and 11 Ci was Th, U, and TRU.

Release Data: Four quarters of groundwater monitoring showed the major groundwater contaminants in downgradient wells to be gross alpha and beta radionuclides.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0 WAG Name: Main Plant Area

SWMU ID Number: 1.14 SWMU Name: Process Waste Pond—(3539)

Location of Unit: The 190 Process Pond (Basin 3539) is an open pond, located in the central ORNL complex (Bethel Valley), south of Building 3584 and east of the Holding Basin 3513. ORNL grid coordiantes are N 21,355 and E 31,340.

General Dimensions and Capacities: The pond has a capacity of 150,000 gal (567,812 L) and measures 65 × 90 ft (20 × 28 m) at the top of the berm. Elevation at the top of the berm is 787 ft (240 m) MSL. Maximum depth is 8 ft (2.4 m). At 6-in.-thick compacted clay liner serves as the bottom of the basin.

Function of the SWMU: The two 190 Process Waste ponds (see also 1.15) are paired surge basins, designed to receive process waste streams from the Building 4500 complex. Waste streams from Building 4500 are split into the basins and monitored for radionuclide content before discharge to White Oak Creek or to the Equalization Basin (3524) and the process waste treatment system (Building 3544). The basins are operated in such a manner that when one pond is filling the other is empty or in the process of being emptied.

Dates of Operation: Site commissioned: 1964
Site is still in operation.

Waste Characteristics: Wastes are derived from floor drains, laboratory drains, steam condensates, and process vessel cooling waters. During January and February 1986, sludge samples were collected from the 190 Process Waste ponds (3539 and 3540) and analyzed for metal, pesticide, herbicide, and volatile organic constituents. A comparison of metal concentrations in EP-TOX extracts from sludge with EP toxicity limits indicated that none exceeded the EP toxicity limits. Pesticide/herbicide extracts were also below limits. Methylene chloride and 1,2-transdichloroethylene were two non-EP-TOX limited volatile organics present with average concentrations of 3.6 and 2.1 μg/L, respectively. Total radioactivity present in the ponds is estimated to be less than 10 Ci.

Release Data: Four quarters of groundwater monitoring revealed significantly higher concentrations of chlorides, Fe, Mn, Pb, and gross beta in groundwater from wells downgradient from the waste pond, as compared to groundwater sampled from upgradient monitoring wells.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0 WAG Name: Main Plant Area

SWMU ID Number: 1.15 SWMU Name: Process Waste Pond—(3540)

Location of Unit: This basin is located South of Basin 3539 and East of the Holding Basin 3513. ORNL grid coordinates are N 21,290 and E 31,340.

General Dimensions and Capacities: The pond has a capacity of 150,000 gal (567,812 L) and measures 65 × 90 ft (20 × 28 m) at the top of the berm. Elevation at the top of the berm is 787 ft (240 m) MSL. Maximum depth is 8 ft (2.4 m). A 6-in.-thick compacted clay liner serves as the bottom of the basin.

Function of the SWMU: The two 190 Process Waste ponds (see also 1.15) are paired surge basins, designed to receive process waste streams from the Building 4500 complex. Waste streams from Building 4500 are split into the basins and monitored for radionuclide content before discharge to White Oak Creek or to the Equalization Basin (3524) and the process waste treatment system (Building 3544). The basins are operated in such a manner that when one pond is filling the other is empty or in the process of being emptied.

Dates of Operation: Site commissioned: 1964.
Site is still in operation.

Waste Characteristics: Wastes are derived from floor drains, laboratory drains, steam condensates, and process vessel cooling waters. During January and February 1986, sludge samples were collected from the 190 Process Waste ponds (3539 and 3540) and analyzed for metal, pesticide, herbicide, and volatile organic constituents. A comparison of metal concentrations in EP-TOX extracts from sludge with EP toxicity limits indicated that none exceeded the EP toxicity limits. Pesticide/herbicide extracts were also below limits. Methylene chloride and 1,2-transdichloroethylene were two non-EP-TOX limited volatile organics present with average concentrations of 3.6 and 2.1 μg/L, respectively. Total radioactivity present in the ponds is estimated to be less than 10 Ci.

Release Data: Four quarters of groundwater monitoring revealed significantly higher concentrations of chlorides, Fe, Mn, Pb, and gross beta in groundwater sampled from upgradient monitoring wells.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.16

SWMU Name: Sewage Aeration Pond (East)—2543

Location of Unit: The sewage aeration ponds (see also SWMU 1.17) are located at the west end of the main plant area. ORNL grid coordinates are N 21,380 and E 30,060.

General Dimensions and Capacities: The capacity of the lagoon is 1×10^6 gal (3.8×10^6 L), or a retention time of about 3 days at normal design flow [300,000 gal/d (1.1×10^6 L/d)].

Function of the SWMU: The site was used to replace an existing primary sewage treatment plant. The basin is lined with plastic and contains aeration systems. The site is available for emergency use.

Dates of Operation: Site constructed: 1974.
The site has been removed from service.

Waste Characteristics: Waste is domestic sewage produced at the ORNL. Because of leakage into sewers, some radioactivity can be detected in the sewage. The inventory of radionuclides is estimated to be less than 10 Ci.

Release Data: When in operation, treated effluent was released to the west sewage lagoon.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.17

SWMU Name: Sewage Aeration Pond (West)—2544

Location of Unit: The sewage aeration ponds (see also SWMU 1.17) are located at the west end of the main plant area. ONRL grid coordinates are N 21,330 and E 29,870.

General Dimensions and Capacities: The capacity of the lagoon is 1×10^6 gal (3.8×10^6 L), or a retention time of about 3 days at normal design flow [300,000 gal/d (1.1×10^6 L/d)].

Function of the SWMU: The site is used to replace an existing primary sewage treatment plant. The basin is lined with plastic and contains aeration systems.

Dates of Operation: The site is still in operation as an equalization basin for the new sewage treatment plant (SWMU 1.52). Site constructed: 1974.

Waste Characteristics: Waste is domestic sewage produced at the ORNL. Because of leakage into sewers, some radioactivity can be detected in the sewage. The inventory of radionuclides is estimated to be less than 10 Ci.

Release Data: Treated effluent was released to White Oak Creek after chlorination. Effluent from the basin now is discharged to the sewage treatment plant (SWMU 1.52). Leaks may have occurred through the plastic liner.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.18

SWMU Name: Coal Pile Settling Basin—(2545)

Location of Unit: The basin is located at the southwest corner of the coal storage pile at the ORNL steam plant. ORNL grid coordinates are N 20,890 and E 30,130.

General Dimensions and Capacities: Capacity of basin is 300,000 gal (1.1×10^6 L).

Function of the SWMU: The basin collects and treats (by pH adjustment and gravity settling) runoff from the coal storage pile and wastewater from an ash transfer operation. Site is now used as a surge basin for the coal pile runoff treatment facility.

Dates of Operation: Basin installed: 1978.
Site is currently in operation.

Waste Characteristics: Waste has chemical composition representative of normal coal pile drainage. No hazardous waste is generated. Drainage release is covered in the ORNL NPDES permit. Average pH of drainage prior to treatment is 2.5.

Release Data: After pH adjustment and settling, the effluent is released to White Oak Creek. It is estimated that the maximum discharge would be around 6.5×10^6 gal/year (2.5×10^7 L/year).

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.19

SWMU Name: Low Intensity Test Reactor (LITR) Pond—(3085W)

Location of Unit: This site is located in the northern part of the main ORNL complex near Building 3005. The two ponds are located about 300 ft (92 m) east of the building. ORNL grid coordinates are N 22,790 and E 31,760.

General Dimensions and Capacities: Each pond is about 8 × 40 ft (2.5 × 12 m). Holding capacity is 18,000 gal (68,000 L).

Function of the SWMU: These ponds were used to retain process waste water before its release into the Fifth Street branch of White Oak Creek. In 1964, the ponds were filled with clay and earth and covered with grass.

Dates of Operation: Reactor commissioned: 1951.
Site inactive: 1968.

Waste Characteristics: Very little information is available. Principal contamination was probably Na-24 (half-life of 15 h). Hydrogeological conditions are similar to sites in the main ORNL installation in Bethel Valley.

Release Data: A radiological study of the site in 1985 showed average activities of Sr-90, Pu-238, and Pu-239 in the soil higher than background, and that there was some contamination due to Cs-137 and Co-60. The radionuclide inventory was estimated at 20 mCi of Cs-137, 1 mCi of Sr-90, and 100 μCi of Pu-239.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.20

SWMU Name: 3517 Filter Pit (Fission Product Development Laboratory)—(3517)

Location of Unit: Located east of Building 3517. ORNL coordinates are N 21,750 and E 31,100.

General Dimensions and Capacities: Unit consists of two banks of fiber roughing filters arranged in series. In the 1960s, the roughing filters were replaced with stainless steel back-washable filters, which were replaced with high efficiency particulate absolute (HEPA) finishing filters.

Function of the SWMU: The unit was designed to filter building air exhaust from the Fission Product Development Laboratory.

Dates of Operation: Began operation in 1958.
Operation continues at present.
(Facility upgrade was completed in 1986.)

Waste Characteristics: Present levels of radiation at the filters measure ~200 R/h. The main radionuclides are Cs-137 and Sr-90.

Release Data: The stainless steel roughing filters were acid backwashed, and the leakage from this operation has contaminated the filter pit. Recent excavation at the site resulted in the removal of large quantities of contaminated soil, with maximum levels of 10 mR/h recorded at contact. An undetermined amount of contaminated soil remains.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0 WAG Name: Main Plant Area

SWMU ID Number: 1.21 SWMU Name: FPDL LLW Transfer Line

Location of Unit: The line runs from the Fission Product Development Laboratory (FPDL, Building 3517) to the South Tank Farm (area 3507). ORNL grid coordinates are N 21,740 and E 30,910.

General Dimensions and Capacities: Originally the line was a 1.5-in. (3.8-cm) diameter stainless steel pipe about 30 ft (9 m) long and covered with a 3-ft (1-m) layer of soil. Part of the line goes near two waste storage tanks (gunite tanks). This portion of the line was abandoned after the gunite tanks (W-5 and W-6) were removed from service.

Function of the SWMU: The line was designed to transfer LLW from the FPDL to collection tanks at the South Tank Farm (area 3507).

Dates of Operation: The line was operated from 1958 to 1978. Low-level wastes from the FPDL are currently carried to a collection header on the west side of the South Tank Farm. This line is 1.5-in. diameter and 300 ft (92 m) long. Both lines are now out of service.

Waste Characteristics: No inventory of radiological wastes exists. The line is thought to be contaminated with Cs-137 and Sr-90.

Release Data: There is no evidence of release from the new or old LLW line.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0 | WAG Name: Main Plant Area

SWMU ID Number: 1.22 | SWMU Name: Isotopes Ductwork/3110 Filter House

Location of Unit: Located on Hillside Avenue, between Third Street and Fifth Street in the ORNL main plant area. ORNL grid coordinates are N 22,400 and E 31,290.

General Dimensions and Capacities: Site consists of a filter house connected to nearby buildings by underground ductwork. For specific information, see engineering drawings D39120–D39125, D43475, D45152, and D45155.

Function of the SWMU: The Filter House is designed to handle air exhaust from cell ventilation in the isotopes area (buildings 3028, 3029, 3030, 3031, 3032, 3033, and 3033A). This site also served Building 3038 and Building 3047. The Filter House receives exhaust from connected buildings and transfers air to the 3029 stack. Inside the Filter House are 42 HEPA filters. Also inside is a floor drain that collects groundwater and transports it by gravity to a sump; water is then pumped to Tank WC-10 (LLW system).

Dates of Operation: Site began operation in early 1960s.
Site was removed from service in 1986.

Waste Characteristics: Type of wastes are not identified but are known to include radionuclides.

Release Data: Contamination results from continuous operation of the Filter House. Specific details of characterization and release data are not available.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.23a

SWMU Name: Inactive LLW Collection/Storage Tank—(W-1)

Location of Unit: Located in the North Tank Farm (3023 Area) near the intersection of Third Street and Central Avenue. ORNL grid coordinates are N 22,210, E 30,809.

General Dimensions and Capacities: The tank is constructed of gunite (sprayed concrete) and is 12 ft (3.6 m) in diameter and 8 ft (2.4 m) tall. Capacity of tank is 4,800 gal (18,000 L). The tank is dome-shaped and covered with 6 ft (1.8 m) of compacted soil.

Function of the SWMU: The tank was designed to hold waste from the 3019 Radiochemical Pilot Plant.

Dates of Operation: Site commissioned: 1943.
Taken out of service: 1960.

Waste Characteristics: Wastes resulted from the Radiochemical Processing Plant (3019). Major contaminants are Sr-90, Cs-137, Eu-152, TRU, and Pu-238. Total inventory of radioactivity in the tank has been calculated to be 142 mCi. No sludge is reported to be in the tank. Major radionuclides are Sr-90 (90 mCi), Cs-137 (20 mCi), and TRU (0.7 mCi). The tank contains 1,000 gal (3,785 L) of liquid.

Release Data: An undetermined amount of leakage occurred in 1960, causing the tank to be taken out of service.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.23b

SWMU Name: Inactive LLW Collection/Storage Tank—(W-2)

Location of Unit: Located in the North Tank Farm (3023 Area) near the intersection of Third Street and Central Avenue. ORNL grid coordinates are N 22,210 and E 30,830.

General Dimensions and Capacities: The tank is constructed of gunite (sprayed concrete) and is 12 ft (3.6 m) in diameter and 8 ft (2.4 m) tall. Capacity of tank is 4,800 gal (18,000 L). The tank is dome-shaped and covered with 6 ft (1.8 m) of compacted soil.

Function of the SWMU: This tank was designed to hold the overflow from tank W-1.

Dates of Operation: Site commissioned: 1943.
Taken out of service: 1960.

Waste Characteristics: Wastes resulted from Radiochemical Processing Plant (3019). Major contaminants are Sr-90, Cs-137, Eu-152, TRU, and Pu-238. Total inventory of radioactivity in the tank was 33 Ci, almost all contained in tank sludge (less than 6 mCi in liquid). Major radionuclides are Pu-238, Sr-90 (10 Ci), Cs-137 (10 Ci), and TRU (7 Ci). The Pu-238 inventory has been reported to be 200 Ci; however, this value is questionable. Tank is reported to contain 500 gal (1,890 L) of sludge and 800 gal (3,000 L) of liquid.

Release Data: An undetermined amount of leakage occurred in 1960, causing tank operation to stop.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.24a

SWMU Name: Inactive LLW Waste Collection/Storage Tank—(W-3)

Location of Unit: Located in the Tank Farm (3023 Area). ORNL coordinates are N 22,180 and E 30,885.

General Dimensions and Capacities: The tank is 25.0 ft (7.6 m) diameter; sidewalls are 12.0 ft (3.6 m) high. The tank is made of gunite and covered with 6.0 ft (1.8 m) of compacted soil. Capacity is 42,500 gal (161,000 L).

Function of the SWMU: The tank was designed to hold metal waste from Building 3019. Tank W-3 received plutonium waste.

Dates of Operation: Site commissioned: 1943.
Taken out of service: 1960s.

Waste Characteristics: Inventory estimates of major radionuclides are Cs-137 (<1000 Ci) and Sr-90 (<100 Ci) and TRU (<100 Ci). Others include Pu-238, Pu-239, Am-241, Cm-244, U-233, U-238. The tank contains 4,200 gal (15,900 L) of sludge and 22,200 gal (84,000 L) of liquid.

Release Data: Tank collected surface water. Soil around the tank is contaminated by Cs-137 and Sr-90.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.24b

SWMU Name: Inactive LLW Waste Collection/Storage Tank—(W-4)

Location of Unit: Located on North Tank Farm (3023 Area). ORNL coordinates are N 22,180 and E 30,920.

General Dimensions and Capacities: The tank is 25.0 ft (7.6 m) diameter; sidewalls are 12.0 ft (3.6 m) high. Tanks are made of gunite and covered with 6.0 ft (1.8 m) of compacted soil. Capacity per tank is 42,500 gal (161,000 L).

Function of the SWMU: The tank was designed to hold metal waste from Building 3019. Tank W-4 received uranium waste.

Dates of Operation: Site commissioned: 1943.
Taken out of service: 1960s.

Waste Characteristics: Tank W-4: Major radionuclides in the high activity sludge are Cs-137, Sr-90, U-238, U-233. Others include Pu-238, Pu-239, Am-241, Cm-244, U-235. Estimated tank inventory is Cs-137 (100 Ci) and Sr-90 (100 Ci), and TRU (4.2 Ci). The tank contains 5,800 gal (22,000 L) of sludge and 11,600 gal (44,000 L) of liquid.

Release Data: Tank collected surface water. It is known that the soil around the tank is contaminated by Cs-137 and Sr-90.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.25a

SWMU Name: Inactive LLW Waste Collection/Storage Tank—(W-13)

Location of Unit: Located at the North Tank Farm (3023 Area). ORNL coordinates N 22,230 and E 30,865.

General Dimensions and Capacities: Tank W-13 is a horizontal tank 11.0 ft (3.35 m) long and 6.0 ft (1.83 m) diameter, capacity of 2,000 gal (7,570 L). Walls of the tank are stainless steel. It is buried in concrete to a depth of 7.5 ft (2.3 m).

Function of the SWMU: Tank W-13 collected waste from the Chemistry Division Hot Laboratory Group.

Dates of Operation: Site commissioned: 1940s.
Taken out of service: 1958.

Waste Characteristics: Estimated inventory is Sr-90 (300 Ci), Cs-137 (30 Ci), and TRU (0.043 Ci). The tank contains 450 gal (1,700 L) of liquid.

Release Data: Reason for decommissioning not documented. No major releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.25b

SWMU Name: LLW Waste Collection/Storage Tank—(W-14)

Location of Unit: Located at the North Tank Farm (3023 Area). ORNL coordinates are N 22,230 and E 30,872.

General Dimensions and Capacities: Tank W-14 is a horizontal tank 11.0 ft (3.35 m) long and 6.0 ft (1.83 m) diameter, capacity of 2,000 gal (7,570 L). Walls of the tank are stainless steel. It is buried in concrete to a depth of 7.5 ft (2.3 m).

Function of the SWMU: Tank W-14 collected wastes from the Operations Division.

Dates of Operation: Site commissioned: 1940s.
Taken out of service: 1958.

Waste Characteristics: Tank W-14 inventory is Sr-90 (8.0 Ci), Cs-137 (6.0 Ci), and TRU (0.0006 Ci). The tank contains 120 gal (454 L) of liquid.

Release Data: Reason for taking out of service not documented. No major releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.25c

SWMU Name: LLW Waste Collection/Storage Tank—(W-15)

Location of Unit: Located at the North Tank Farm (3023 Area). ORNL coordinates are N 22,222 and E 30,880.

General Dimensions and Capacities: Tank W-15 is a vertical cylinder tank 6.0 ft (1.8 m) tall, 8.0 ft (2.4 m) in diameter. Capacity is also 2,000 gal (7,570 L). Walls of the tank are stainless steel. It is buried in concrete to a depth of 7.5 ft (2.3 m).

Function of the SWMU: Tank W-15 collected wastes from the Operations Division.

Dates of Operation: Site commissioned: 1940s.
Taken out of service: 1958.

Waste Characteristics: No inventory estimate is available for Tank W-15. No estimates of remaining liquid or sludge have been made.

Release Data: Major radionuclides are the same as for W-14. Reason for taking out of service not documented.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.26a

SWMU Name: Inactive LLW Waste Collection/Storage Tank—(W-5)

Location of Unit: Located at South Tank Farm (3507 Area), near the intersection of Central Avenue and Third Street. ORNL grid coordinates are N 22,000 and E 30,850.

General Dimensions and Capacities: Constructed of reinforced gunite. The tanks are underground (two rows of three each) on a 60.0-ft (18.3-m) grid. Inside diameter is 50.0 ft (15.2 m), and the height is 12.0 ft (3.7 m). Each tank is covered with a 6-ft (1.8-m) layer of compacted soil. Capacity is 170,000 gal (643,000 L).

Function of the SWMU: The tank was designed to store wastes from various ORNL projects and programs.

Dates of Operation: Site commissioned: 1943.
Taken out of service: 1978. The tank was emptied in the early 1980s.

Waste Characteristics: Major contaminants are Sr-90, Cs-137, Th-232, U-238, and TRU. Inventory: Sr-90 (0.3 kCi), Cs-137 (0.02 kCi), and others (0.01 kCi). Volume of sludge remaining in tank is estimated to be 6,000 gal (22,700 L).

Release Data: Rainwater has infiltrated the tanks. No leakage reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.26b

SWMU Name: Inactive LLW Waste Collection/Storage Tank—(W-6)

Location of Unit: ORNL grid coordinates are N 21,940 and E 30,850.

General Dimensions and Capacities: Constructed of reinforced gunite. The tanks are underground (two rows of three each) on a 60.0-ft (18.3-m) grid. Inside diameter is 50.0 ft (15.2 m), and the height is 12.0 ft (3.7 m). Each tank is covered with a 6-ft (1.8-m) layer of compacted soil. Capacity is 170,000 gal (643,000 L).

Function of the SWMU: The tank was designed to store wastes from various ORNL projects and programs.

Dates of Operation: Site commissioned: 1943.
Taken out of service: 1978. The tank was emptied in the early 1980s.

Waste Characteristics: Major contaminants are Sr-90, Cs-137, Th-232, U-238, and TRU. Inventory is Sr-90 (2.0 kCi), Cs-137 (0.15 kCi), and others (0.04 kCi). Volume of sludge remaining in tank is estimated to be 15,000 gal (56,780 L).

Release Data: Rainwater has infiltrated the tank. No leakage reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.26c

SWMU Name: Inactive LLW Waste Collection/Storage Tank—(W-7)

Location of Unit: ORNL grid coordinates are N 22,000 and E 30,910.

General Dimensions and Capacities: Constructed of reinforced gunite. The tanks are underground (two rows of three each) on a 60.0-ft (18.3-m) grid. Inside diameter is 50.0 ft (15.2 m), and the height is 12.0 ft (3.7 m). Each tank is covered with a 6-ft (1.8-m) layer of compacted soil. Capacity is 170,000 gal (643,000 L).

Function of the SWMU: The tank was designed to store wastes from various ORNL projects and programs.

Dates of Operation: Site commissioned: 1943.
Taken out of service: 1978. The tank was emptied in the early 1980s.

Waste Characteristics: Major contaminants are Sr-90, Cs-137, Th-232, U-238, and TRU. Inventory is Sr-90 (2.0 kCi), Cs-137 (0.15 kCi), and others (0.04 kCi). Volume of sludge remaining in tank is minimal.

Release Data: Rainwater has infiltrated the tank. No leakage reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.26d

SWMU Name: Inactive LLW Waste Collection/Storage Tank—(W-8)

Location of Unit: ORNL grid coordinates are N 21,940 and E 30,910.

General Dimensions and Capacities: Constructed of reinforced gunite. The tanks are underground (two rows of three each) on a 60.0-ft (18.3-m) grid. Inside diameter is 50.0 ft (15.2 m), and the height is 12.0 ft (3.7 m). Each tank is covered with a 6-ft (1.8-m) layer of compacted soil. Capacity is 170,000 gal (643,000 L).

Function of the SWMU: The tank was designed to store wastes from various ORNL projects and programs.

Dates of Operation: Site commissioned: 1943.
Taken out of service: 1978. The tank was emptied in the early 1980s.

Waste Characteristics: Major contaminants are Sr-90, Cs-137, Th-232, U-238, and TRU. Inventory is Sr-90 (2.0 kCi), Cs-137 (0.15 kCi), and others (0.04 kCi). Volume of sludge remaining in tank is 1,000 gal (3,785 L).

Release Data: Rainwater has infiltrated the tank. No leakage reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.26e

SWMU Name: Inactive LLW Waste Collection/Storage Tank—(W-9)

Location of Unit: ORNL grid coordinates are N 22,000 and E 30,970.

General Dimensions and Capacities: Constructed of reinforced gunite. The tanks are underground (two rows of three each) on a 60.0-ft (18.3-m) grid. Inside diameter is 50.0 ft (15.2 m), and the height is 12.0 ft (3.7 m). Each tank is covered with a 6-ft (1.8-m) layer of compacted soil. Capacity is 170,000 gal (643,000 L).

Function of the SWMU: The tank was designed to store wastes from various ORNL projects and programs.

Dates of Operation: Site commissioned: 1943.
Taken out of service: 1978. The tank was emptied in the early 1980s.

Waste Characteristics: Major contaminants are Sr-90, Cs-137, Th-232, U-238, and TRU. Inventory is Sr-90 (2.0 kCi), Cs-137 (0.15 kCi), and others (0.04 kCi). Volume of sludge remaining in tank is estimated to be 3,000 gal (11,360 L).

Release Data: Rainwater has infiltrated the tank. No leakage reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.26f

SWMU Name: Inactive LLW Waste Collection/Storage Tank—(W-10)

Location of Unit: ORNL grid coordinates are N 21,940 and E 30,970.

General Dimensions and Capacities: Constructed of reinforced gunite. The tanks are underground (two rows of three each) on a 60.0-ft (18.3-m) grid. Inside diameter is 50.0 ft (15.2 m), and the height is 12.0 ft (3.7 m). Each tank is covered with a 6-ft (1.8-m) layer of compacted soil. Capacity is 170,000 gal (643,000 L).

Function of the SWMU: The tank was designed to store wastes from various ORNL projects and programs.

Dates of Operation: Site commissioned: 1943.
Taken out of service: 1978. The tank was emptied in the early 1980s.

Waste Characteristics: Major contaminants are: Sr-90, Cs-137, Th-232, U-238, and TRU. Inventory is Sr-90 (7.0 kCi), Cs-137 (0.96 kCi), and others (0.33 kCi). Volume of sludge remaining in tank is estimated to be 40,000 gal (151,400 L).

Release Data: Rainwater has infiltrated the tank. No leakage reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.27

SWMU Name: Inactive LLW Waste Collection/Storage Tank—(W-11)

Location of Unit: Located on the southeast corner of the South Tank Farm (3057 Area), about 100 ft (30 m) north of the east of Building 3517 and about 50 ft (15 m) from Building 3515. ORNL coordinates N 21,865 and E 31,050.

General Dimensions and Capacities: Tank W-11 measures 8.0 ft (2.4 m) in diameter and 5.5 ft (1.7 m) in height. Its capacity is 1,500 gal (5,677 L); it is covered with 6.0 ft (1.8 m) of soil overburden. It is a gunite tank.

Function of the SWMU: The tank was designed to serve in waste collection and monitoring for research laboratories in Building 3550.

Dates of Operation: Site commissioned: 1943.
Taken out of service: about 1984.

Waste Characteristics: The tank contains about 305 gal (1,200 L) of liquid and sludge residue. Major radionuclides present are Cs-137, Sr-90, and Pu-238. The interior surface of the tank access is contaminated with transferable beta-gamma and alpha activities of 700 and 300 dpm/100 sq cm, respectively. Near the surface of the tank, direct beta-gamma absorbed dose rates were mostly below 1 mrad/h, except in the pump pit area, where a maximum rate of 28 mrad/h was measured. Estimated inventory is Sr-90 (0.001 Ci), Cs-137 (0.001 Ci), and TRU (0.001 Ci). Of the 305 gal remaining in the tank, 45 gal is sludge and 260 gal is liquid.

Release Data: Tank was removed from service because of leaks. Surface soil samples show that the tank site is contaminated with Sr-90 and Cs-137.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.28

SWMU Name: Inactive LLW Waste Collection/Storage Tank—(W-1A)

Location of Unit: Located at the North Tank Farm (3023 Area), northeast of the intersection of Third Street and Central Avenue. ORNL coordinates are N 22,255 and E 30,810.

General Dimensions and Capacities: Tank is made of stainless steel and has a capacity of 4,000 gal (15,000 L). It is covered with more than 6.0 ft (1.8 m) of soil. Tank is horizontal. Diameter is 7.5 ft (2.3 m) and length is 13.5 ft (4.1 m).

Function of the SWMU: Tank W1-A collected wastes from the high radiation level analytical facilities of buildings 2026, 3019-B, and the Radiochemical Processing Pilot Plant (3019).

Dates of Operation: Site commissioned: mid 1950s.
Taken out of service: about 1986.

Waste Characteristics: Major contaminants: Sr-90, Cs-137, U-233, TRU. Radionuclide inventory is unknown. There are no records of sludge/liquid volumes.

Release Data: Estimated radiation exposure rates in excess of 100 R/h may be present in the tank and inlet process lines. However, the transfer line to Tank W-1A from buildings 2026 and 3019 is strongly suspected of leaking and contaminating soil near the tank. For this reason, Tank W-1A was removed from service.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0 WAG Name: Main Plant Area

SWMU ID Number: 1.29 SWMU Name: Inactive LLW Waste Collection/Storage Tank—(WC-1)

Location of Unit: Tank is located east of Bldg. 3038 and west of Bldg. 3037 near the center of the main ORNL complex. Fifth Avenue Creek is about 150 ft (46 m) east of the tank. ORNL coordinates are N 22,144 and E 31,676.

General Dimensions and Capacities: Tank is 8.66 ft (2.6 m) in diameter, 6.0 ft (1.8 m) high, and constructed of stainless steel. Capacity is 2,000 gal (7,600 L).

Function of the SWMU: The tank was used for the collection and monitoring of process liquid waste from isotope production and development laboratories (buildings 3038, 3029, 3028, 3030, 3031, 3032, 3033, and 3047). The tank also collected waste from the Building 3110 filter, 3039 stack, and 3092 scrubber.

Dates of Operation: Site commissioned: 1950s.
Taken out of service: 1968.

Waste Characteristics: Main contaminants: Sr-90 (<10 Ci estimated), Cs-137 (<10 Ci estimated), and TRU (<0.1 Ci estimated). Curie amounts of Co-60 are also detectable. No information is available on sludge or liquid volumes in tank.

Release Data: Maximum direct beta-gamma absorbed dose is 0.23 mrad/h at 0.4 to 1.2 in. (1 to 3 cm) above surface and 10 ft (3 m) from tank. Highest Cs-137 and Co-60 activities were 1,188 pCi/g and 567 pCi/g, respectively. Highest Sr-90 concentrations were 207 pCi/mL and 97 pCi/mL.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.30a

SWMU Name: Inactive LLW Waste Collection/Storage Tank—(WC-15)

Location of Unit: Located south of Building 3587 and west of Building 4508 near the intersection of Fifth Street and White Oak Avenue. Fifth Creek is about 65 ft (20 m) east of the tank site. ORNL grid coordinates are N 21,730 and E 31,771.

General Dimensions and Capacities: Tank is made of stainless steel and is placed underground, with about 10.0 ft (3.0 m) of soil and gravel cover. Diameter: 5.5 ft (1.7 m). Height: 7.33 ft (2.23 m). It is not accessible from ground level. Capacity is 1,000 gal (3,780 L).

Function of the SWMU: Tank was designed to receive waste from research laboratories in Building 4500.

Dates of Operation: Site commissioned: 1951.
Taken out of service: 1960.

Waste Characteristics: Main radionuclides are probably the same as tank WC-17 (Cs-137, Sr-90, and TRU). Radionuclide inventory unknown but estimated to be less than 0.1 Ci. No records of sludge or liquid volume exist.

Release Data: Tank was taken out of service because of leaks. Soil cores taken in the vicinity of tanks WC-15 and WC-17 are contaminated over their full length with no predominant distribution pattern. Radionuclides observed in the soil include Cs-137, Sr-90, Co-60, Am-241, and Cm-244.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.30b

SWMU Name: Inactive LLW Waste Collection/Storage Tank—(WC-17)

Location of Unit: Located south of Building 3587 and west of Building 4508 near the intersection of Fifth Street and White Oak Avenue. Fifth Creek is about 65 ft (20 m) east of the tank site. ORNL grid coordinates are N 21,736 and E 31,771.

General Dimensions and Capacities: Tank is made of stainless steel and is placed underground, with about 10.0 ft (3.0 m) of soil and gravel cover. Diameter: 5.5 ft (1.7 m). Height: 7.33 ft (2.23 m). It is not accessible from ground level. Capacity is 1,000 gal (3,780 L).

Function of the SWMU: Tank was designed to receive waste from research laboratories in Building 4500.

Dates of Operation: Site commissioned: 1951.
Taken out of service: 1960.

Waste Characteristics: Main radionuclides are Cs-137, Sr-90, and TRU. The tank is full of oil (~80 gal) and water. The total radionuclide inventory is 2.2 mCi of Sr-90, 0.5 mCi of Cs-137, and 1.2 mCi of TRU.

Release Data: Tank was taken out of service because of leaks. Soil cores taken in the vicinity of tanks WC-15 and WC-17 are contaminated over their full length with no predominant distribution pattern. Radionuclides observed in the soil include Cs-137, Sr-90, Co-60, Am-241, and Cm-244.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.31a

SWMU Name: Inactive LLW Waste Collection/Storage Tank—(TH-1)

Location of Unit: Located near Building 3503 (south of the building) and south of White Oak Avenue. ORNL coordiantes are N 21,520 and E 31,400.

General Dimensions and Capacities: Volume: 2,500 gal (9,462 L). Length is 10 ft (3 m), diameter is 7.0 ft (2.1 m). The tank is subsurface and made of stainless steel, with about 5.0 ft (1.5 m) of soil cover. TH-1 was a used tank prior to being installed. The tank is mounted on a flat surface concrete pad with U-bolts. It is not embedded in concrete.

Function of the SWMU: Tank received waste from the thorium pilot plant project in Building 3503.

Dates of Operation: Site commissioned: 1948.
Taken out of service: 1970.

Waste Characteristics: Tank contains an estimated 475 gal (1,800 L) of liquid. Major radionuclides are Cs-137, Co-60, Sr-90, and traces of TRU. Inventory is Sr-90 (0.6 Ci), Cs-137 (0.5 Ci), and TRU (0.2 mCi).

Release Data: A walk-over survey found absorbed dose rates to be 3.2 mrad/h. The highest levels of Cs-137 and Sr-90 in surface soils were 7.6 nCi/g and 4.6 nCi/g, respectively. Groundwater was encountered at a core site (16.1 ft [4.9 m] below grade) and determined to be contaminated with Sr-90 at a concentration of 97 pCi/mL.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.31b

SWMU Name: Inactive LLW Waste Collection/Storage Tank—(TH-2)

Location of Unit: The site is located near Building 3503 (south of the building) and south of White Oak Avenue. ORNL coordinates are N 21,524 and E 31,420.

General Dimensions and Capacities: The tank is 7.0 ft (2.1 m) in diameter and 10 ft (3.0 m) tall. Capacity is 2,400 gal (9,084 L).

Function of the SWMU: The tank received waste from the thorium pilot plant project in Building 3503.

Dates of Operation: Site commissioned: 1952.
Taken out of service: 1970.

Waste Characteristics: Because of high radiation levels, Tank TH-2 was not sampled for radioactivity. The direct reading at the top of the tank measured 150 mrad/h, and the transferable counts were 50 dpm alpha and 3,000 dpm beta-gamma per 100 sq cm. Dose rate increased after shielding was removed,direct dose rate was 6 rad/h, and transferable contamination was 100 dpm alpha and 22,000 dpm beta-gamma per 100 sq cm, respectively.

Release Data: A walk-over survey found absorbed dose rates to be 3.2 mrad/h. The highest levels of Cs-137 and Sr-90 in surface soils were 7.6 nCi/g and 4.6 nCi/g, respectively. Groundwater was encountered at a core site (16.1 ft [4.9 m] below grade) and determined to be contaminated with Sr-90 at a concentration of 97 pCi/mL.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.31c

SWMU Name: Inactive LLW Waste Collection/Storage Tank—(TH-3)

Location of Unit: The site is located near Building 3503 (south of the building) and south of White Oak Avenue. ORNL coordinates are N 21,524 and E 31,436.

General Dimensions and Capacities: Capacity is 3,300 gal (12,490 L), diameter is 9.2 ft (2.8 m), and height is 10 ft (3 m).

Function of the SWMU: The tank received waste from the thorium pilot plant project in Building 3503.

Dates of Operation: Site commissioned: 1952.
Taken out of service: 1970.

Waste Characteristics: The tank contains an estimated 700 gal (1,800 L) of liquid. Major radionuclides are Cs-137, Co-60, Sr-90, and traces of TRU. Inventory is Sr-90 (0.6 Ci), Cs-137 (0.6 Ci), and TRU (0.0002 Ci). Total radioactivity measures about 1 Ci.

Release Data: A walk-over survey found absorbed dose rates to be 3.2 mrad/h. The highest levels of Cs-137 and Sr-90 in surface soils were 7.6 nCi/g and 4.6 nCi/g, respectively. Groundwater was encountered at a core site (16.1 ft [4.9 m] below grade) and determined to be contaminated with Sr-90 at a concentration of 97 pCi/mL.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.32

SWMU Name: Inactive LLW Waste Collection/Storage Tank—(TH-4)

Location of Unit: Located in the central ORNL complex between Central Avenue and White Oak Avenue. The nearest building is Bldg. 3500. See ORNL coordinates N 21,760 and E 31,515.

General Dimensions and Capacities: Tank is made of gunite. Capacity is 14,265 gal (54,000 L); diameter is 20 ft (6 m); height is 9.0 ft (2.7 m). Tank is covered with about 6.0 ft (1.8 m) of soil.

Function of the SWMU: Tank was placed in service to receive waste from the irradiated thorium and uranium pilot plant development projects.

Dates of Operation: Site commissioned: 1943.
Taken out of service: 1970.

Waste Characteristics: At present, the tank is filled with alkaline thorium and uranium sludge. Most of the radioactivity in the tank is due to Cs-137 and small amounts of TRU. Total radioactivity is estimated to be <1Ci. Maximum absorbed dose rate above the tank contents was 8.1 mrad/h. The direct reading at the tank opening was 0.5 mrad/h. No direct dose rate greater than 0.1 mrad/h was detected at the tank site, except for readings of 0.26 mrad/h and 0.32 mrad/h at pipe locations. Major radionuclide inventory is Sr-90 (0.06 Ci), Cs-137 (0.5 Ci), TRU (0.085 Ci).

Release Data: Soil samples revealed that there was no significant contamination at this site, with no activity exceeding 27 pCi/g.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.33

SWMU Name: Active LLW Waste Collection Tank—(2026)

Location of Unit: Located east of Building 2026. ORNL coordinates are N 22,550 and E 30,655.

General Dimensions and Capacities: Tank type: Vertical. Diameter is 4.0 ft (1.2 m); height is 6.5 ft (1.9 m); capacity is 500 gal (1,892 L). Tank is in a stainless-steel-lined concrete vault covered by 11.3 ft (3.4 m) of soil.

Function of the SWMU: Tank collects LLW streams from Building 2026 and discharges into Tank W-1A through a 2.0-in. (5.1-cm) diameter Hastalloy line.

Dates of Operation: Site commissioned: 1961.
Tank is still in service. ORNL is currently rerouting the effluent of this tank to discharge into one of the valve boxes located at the South Tank Farm.

Waste Characteristics: Tank 2026 is an active waste collection tank. The waste in the tank is pumped or jetted to the waste storage tanks at a preset time interval, or when the tank is filled. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.34

SWMU Name: Active LLW Waste Collection Tank—(WC-2)

Location of Unit: The site is located east of Building 3092. ORNL coordinates are N 22,210 and E 31,445.

General Dimensions and Capacities: The tank is vertical. Diameter is 5.5 ft (1.7 m). Height is 7.33 ft (2.2 m). Capacity is 1,000 gal (3,785 L).

Function of the SWMU: The purpose of the tank is to collect LLW streams contaminated with I-131 from buildings 3028, 3038, and 3110. The tank discharges to Valve Box No. 2 at the South Tank Farm by way of a 2-in. (5-cm) stainless steel line.

Dates of Operation: Site commissioned: 1951.
Tank is still in service.

Waste Characteristics: Tank WC-2 is an active waste collection tank. The waste in the tank is pumped or jetted to the waste storage tanks at a preset time interval or when the tank is filled. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0 WAG Name: Main Plant Area

SWMU ID Number: 1.35 SWMU Name: Active LLW Waste Collection Tank—(WC-3)

Location of Unit: Located south of Building 3025. ORNL coordinates are N 22,310 and E 31,175.

General Dimensions and Capacities: Vertical tank. Diameter is 5.5 ft (1.7 m). Height is 7.3 ft (2.2 m). Capacity is 1,000 gal (3,785 L).

Function of the SWMU: Purpose is to collect LLW streams from buildings 3025 and 3110. This tank discharges into Valve Box No. 1 by way of a 2-in. (5-cm) stainless steel line.

Dates of Operation: Site commissioned: 1950.
Tank is still in service.

Waste Characteristics: Tank WC-3 is an active waste collection tank. The waste in the tank is pumped or jetted to the waste storage tanks at a preset time interval, or when the tank is filled. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.36

SWMU Name: Inactive LLW Waste Collection Tank—(WC-4)

Location of Unit: The ORNL coordinates for the tank are N 22,210 and E 31,145. This tank is located west of Building 3026.

General Dimensions and Capacities: The tank is a vertical stainless steel tank that rests on a concrete slab. The tank is 7.0 ft (2.1 m) in diameter and 7.0 ft in length. The top of the tank is located 8 ft (2.4 m) below the surface. It has a volume of 1,700 gal (6,435 L) and a normal operating volume of 1,200 gal (4,542 L). The tank receives waste through a 1-in.-diam (2.5-cm-diam) stainless steel line. It discharges through a 2-in. (5-cm) stainless steel pipe.

Function of the SWMU: The tank receives waste from Building 3026 and discharges to Valve Box No. 2 at the South Tank Farm.

Dates of Operation: Date installed: early 1950s.
Taken out of service.

Waste Characteristics: Tank WC-4 is an inactive waste collection tank. The waste in the tank is pumped or jetted to the waste storage tanks at a preset time interval, or when the tank is filled. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.37a

SWMU Name: Active LLW Waste Collection Tank—(WC-5)

Location of Unit: The ORNL coordinates for the tank are N 21,515 and E 31,425. This tank is located south of Building 3503.

General Dimensions and Capacities: The unit is a vertical stainless steel tank that rests on a concrete slab. The tank is 5.5 ft (1.7 m) in diameter and 7.3 ft (2.2 m) in length. The tank top is located 8 ft (2.4 m) below the surface. It has a volume of 1,000 gal (3,785 L) and a normal operating volume of 750 gal (2,839 L). All lines entering or leaving the tank are 2-in.-diam (5-cm-diam) stainless steel.

Function of the SWMU: The tank receives waste from Building 3503 and discharges to Valve Box No. 2 at the South Tank Farm.

Dates of Operation: Date installed: 1952.
Tank is still in service.

Waste Characteristics: Tank WC-5 is an active waste collection tank. The waste in the tank is pumped or jetted to the waste storage tanks at a preset time interval, or when the tank is filled. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.37b

SWMU Name: Active LLW Waste Collection Tank—(WC-6)

Location of Unit: The ORNL coordinates for the tank are N 21,510 and E 31,425. This tank is located south of Building 3503.

General Dimensions and Capacities: The unit is a vertical stainless steel tank that rests on a concrete slab. The tank is 4.5 ft (1.4 m) in diameter and 5.67 ft (1.7 m) in length. The tank top is located 9.7 ft (2.9 m) below the surface. It has a volume of 500 gal (1,892 L) and a normal operating volume of 350 gal (1,324 L). All lines entering or leaving the tank are 2-in.-diam (5-cm-diam) stainless steel.

Function of the SWMU: The tank receives waste from buildings 3508, 3541, and 3592. It discharges to Valve Box No. 2 at the South Tank Farm.

Dates of Operation: Date installed: 1952.
Tank is still in service.

Waste Characteristics: Tank WC-6 is an active waste collection tank. The waste in the tank is pumped or jetted to the waste storage tanks at a preset time interval, or when the tank is filled. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0 WAG Name: Main Plant Area

SWMU ID Number: 1.37c SWMU Name: Active LLW Waste Collection Tank—(WC-8)

Location of Unit: The ORNL coordinates for the tank are N 21,505 and E 31,425. This tank is located south of Building 3503.

General Dimensions and Capacities: The unit is a vertical stainless steel tank that rests on a concrete slab. The tank is 5.5 ft (1.7 m) in diameter and 7.3 ft (2.2 m) in length. The tank top is located 4.0 ft (1.2 m) below the surface. It has a volume of 1,000 gal (3,785 L) and a normal operating volume of 750 gal (2,839 L). All lines entering or leaving the tank are 2-in.-diam (5-cm-diam) stainless steel.

Function of the SWMU: The tank receives waste from Building 3508 and discharges to Valve Box No. 2 at the South Tank Farm.

Dates of Operation: Date installed: 1952.
Tank is still in service.

Waste Characteristics: Tank WC-8 is an active waste collection tank. The waste in the tank is pumped or jetted to the waste storage tanks at a preset time interval, or when the tank is filled. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.37d

SWMU Name: Active LLW Waste Collection Tank—(WC-9)

Location of Unit: The ORNL coordinates for the tank are N 21,500 and E 31,400. This tank is located south of Building 3503.

General Dimensions and Capacities: The unit is a vertical stainless steel tank that rests on a concrete slab. The tank is 7.0 ft (2.1 m) in diameter and 10.75 ft (3.3 m) in length. The tank top is located 6.5 ft (1.9 m) below the surface. It has a volume of 2,140 gal (8,100 L) and a normal operating volume of 1,550 gal (5,867 L). All lines entering or leaving the tank are 2-in.-diam (5-cm-diam) stainless steel.

Function of the SWMU: The tank receives waste from Building 3503 and discharges to Valve Box No. 2 at the South Tank Farm.

Dates of Operation: Date installed: 1952.
Tank is still in service.

Waste Characteristics: Tank WC-9 is an active waste collection tank. The waste in the tank is pumped or jetted to the waste storage tanks at a preset time interval, or when the tank is filled. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0 WAG Name: Main Plant Area

SWMU ID Number: 1.38 SWMU Name: Active LLW Waste Collection Tank—(WC-7)

Location of Unit: The ORNL coordinates for the tank are N 21,600 and E 31,200. This tank is located west of Building 3504.

General Dimensions and Capacities: The unit is a vertical stainless steel tank that rests on a concrete slab. The tank is 5.3 ft (1.6 m) in diameter and 7.4 ft (2.2 m) in length. The tank top is located 4.7 ft (1.4 m) below the surface. It has a volume of 1,100 gal (4,164 L) and a normal operating volume of 750 gal (2,839 L). The lines entering and leaving the tank are 2-in.-diam (5-cm-diam) steel pipes.

Function of the SWMU: The tank collects low-level waste from Building 3504. It discharges to Valve Box No. 1 at the South Tank Farm.

Dates of Operation: Date installed: 1951.
Tank is still in service.

Waste Characteristics: Tank WC-7 is an active waste collection tank. The waste in the tank is pumped or jetted to the waste storage tanks at a preset time interval, or when the tank is filled. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0 | WAG Name: Main Plant Area

SWMU ID Number: 1.39a | SWMU Name: Active LLW Waste Collection Tank—(WC-10)

Location of Unit: The ORNL coordinates for the tank are N 21,715 and E 31,765. This tank is located south of Building 3587.

General Dimensions and Capacities: The unit is a horizontal stainless steel tank enclosed in a concrete vault. The tank is 6.3 ft (1.9 m) in diameter and 10.3 ft (3.1 m) long. The depth from the ground surface to the top of the tank is 10.3 ft. The unit has a volume of 2,300 gal (8,706 L) and a normal operating volume of 1,650 gal (6,245 L).

Function of the SWMU: The tank collects low-level waste streams from buildings 3029, 3030, 3031, 3032, 3033, 3047, 3092, and 3039. It discharges to Valve Box No. 1 at the South Tank Farm.

Dates of Operation: Date installed: 1951.
Tank is still in service.

Waste Characteristics: Tank WC-10 is an active waste collection tank. The waste in the tank is pumped or jetted to the waste storage tanks at a preset time interval, or when the tank is filled. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.39b

SWMU Name: Active LLW Waste Collection Tank—(WC-11)

Location of Unit: The ORNL coordinates for the tank are N 21,730 and E 31,765. This tank is located south of Building 3587.

General Dimensions and Capacities: The unit is a horizontal stainless steel tank enclosed in a concrete vault. The tank is 7.7 ft (2.3 m) in diameter and 13.7 ft (4.2 m) long. The depth from the ground surface to the top of the tank is 9.0 ft (2.7 m). The unit has a volume of 4,600 gal (17,412 L) and a normal operating volume of 2,900 gal (10,977 L).

Function of the SWMU: The tank receives waste from buildings 4500N Wing 1, 4505, 4507, and 4556. It discharges to Valve Box No. 1 at the South Tank Farm.

Dates of Operation: Date installed: 1951.
Tank is still in service.

Waste Characteristics: Tank WC-11 is an active waste collection tank. The waste in the tank is pumped or jetted to the waste storage tanks at a preset time interval, or when the tank is filled. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0 WAG Name: Main Plant Area

SWMU ID Number: 1.39c SWMU Name: Active LLW Waste Collection Tank—(WC-12)

Location of Unit: The ORNL coordinates for the tank are N 21,710 and E 31,770. This tank is located south of Building 3587.

General Dimensions and Capacities: The unit is a vertical stainless steel tank that rests on a concrete slab. The tank is 5.5 ft (1.7 m) in diameter and 7.9 ft (2.3 m) long. The depth from the ground surface to the top of the tank is 9.1 ft (2.8 m). The unit has a volume of 1,000 gal (3,785 L) and a normal operating volume of 700 gal (2,649 L).

Function of the SWMU: The tank receives waste from buildings 4505 and 4507. It discharges to Valve Box No. 1 at the South Tank Farm.

Dates of Operation: Date installed: 1951.
Tank is still in service.

Waste Characteristics: Tank WC-12 is an active waste collection tank. The waste in the tank is pumped or jetted to the waste storage tanks at a preset time interval, or when the tank is filled. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.39d

SWMU Name: Active LLW Waste Collection Tank—(WC-13)

Location of Unit: The ORNL coordinates for the tank are N 21,725 and E 31,770. This tank is located south of Building 3587.

General Dimensions and Capacities: The unit is a vertical stainless steel tank that rests on a concrete slab. The tank is 5.5 ft (1.7 m) in diameter and 7.3 ft (2.2 m) long. The depth from the ground surface to the top of the tank is 9.3 ft (2.8 m). The unit has a volume of 1,000 gal (3,785 L) and a normal operating volume of 700 gal (2,649 L).

Function of the SWMU: The tank receives waste from buildings 4500S, 4500N, 4507, and 4508. It discharges to Valve Box No. 1 at the South Tank Farm.

Dates of Operation: Date installed: 1951.
Tank is still in service.

Waste Characteristics: Tank WC-13 is an active waste collection tank. The waste in the tank is pumped or jetted to the waste storage tanks at a preset time interval, or when the tank is filled. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.39e

SWMU Name: Active LLW Waste Collection Tank—(WC-14)

Location of Unit: The ORNL coordinates for the tank are N 21,720 and E 31,770. This tank is located south of Building 3587.

General Dimensions and Capacities: The unit is a vertical stainless steel tank that rests on a concrete slab. The tank is 5.5 ft (1.7 m) in diameter and 7.3 ft (2.2 m) long. The depth from the ground surface to the top of the tank is 9.3 ft (2.8 m). The unit has a volume of 1,000 gal (3,785 L) and a normal operating volume of 700 gal (2,649 L).

Function of the SWMU: The tank receives waste from Buildings 4501 and 4507. It discharges to Valve Box No. 1 at the South Tank Farm.

Dates of Operation: Date installed: 1951.
Tank is still in service.

Waste Characteristics: Tank WC-14 is an active waste collection tank. The waste in the tank is pumped or jetted to the waste storage tanks at a preset time interval, or when the tank is filled. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0 WAG Name: Main Plant Area

SWMU ID Number: 1.40 SWMU Name: Active LLW Waste Collection Tank—(WC-19)

Location of Unit: The ORNL coordinates for the tank are N 22,430 and E 31,595. This tank is located northeast of Building 3028.

General Dimensions and Capacities: The unit is a horizontal stainless steel tank enclosed in a concrete vault. The tank is 6.1 ft (1.8 m) in diameter and 9.7 ft (2.9 m) long. The depth from the ground surface to the top of the tank is 12.9 ft (3.9 m). The unit has a volume of 2,100 gal (7,949 L) and a normal operating volume of 1,500 gal (5,678 L).

Function of the SWMU: The tank receives low-level waste streams from buildings 3001, 3002, 3003, 3004, 3005, 3008, 3104, 3010, 3119 and 3042. It discharges to Valve Box No. 1 located at the South Tank Farm.

Dates of Operation: Date installed: 1953.
Tank is still in service.

Waste Characteristics: Tank WC-19 is an active waste collection tank. The waste in the tank is pumped or jetted to the waste storage tanks at a preset time interval, or when the tank is filled. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.41

SWMU Name: Active LLW Waste Collection Tank—(W-12)

Location of Unit: The ORNL coordinates for the tank are N 21,875 and E 31,060. This is located southwest of Building 3525.

General Dimensions and Capacities: The unit is a vertical stainless steel tank that rests on a concrete slab. The tank is 4.0 ft (1.2 m) in diameter and 5.33 ft (1.6 m) long. The tank has a volume of 700 gal (2,650 L) and a normal operating volume of 400 gal (1,500 L).

Function of the SWMU: The tank receives waste from buildings 3525 and 3517.

Dates of Operation: Date installed: 1951.
Tank is still in service.

Waste Characteristics: Tank W-12 is an active waste collection tank. The waste in the tank is pumped or jetted to the waste storage tanks at a preset time interval, or when the tank is filled. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.42a

SWMU Name: Active LLW Waste Collection Tank—(W-16)

Location of Unit: The ORNL coordinates for the tank are N 22,035 and E 31,065. This tank is located east of the South Tank Farm.

General Dimensions and Capacities: The unit is a vertical stainless steel tank that rests on a concrete slab. The tank is 5.5 ft (1.7 m) in diameter and 7.3 ft (2.2 m) long. The depth from the ground surface to the top of the tank is 9.3 ft (2.8 m). The unit has a volume of 1,000 gal (3,785 L) and a normal operating volume of 700 gal (2,649 L).

Function of the SWMU: This tank collects LLW from hot cells in Building 3026.

Dates of Operation: Date installed: 1950.
Tank is still in service.

Waste Characteristics: Tank W-16 is an active waste collection tank. The waste in the tank is pumped or jetted to the waste storage tanks at a preset time interval, or when the tank is filled. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.42b

SWMU Name: Active LLW Waste Collection Tank—(W-17)

Location of Unit: The ORNL coordinates for the tank are N 22,030 and E 31,065. This tank is located east of the South Tank Farm.

General Dimensions and Capacities: The unit is a vertical stainless steel tank that rests on a concrete slab. The tank is 5.5 ft (1.7 m) in diameter and 7.3 ft (2.2 m) long. The depth from the ground surface to the top of the tank is 9.3 ft (2.8 m). The unit has a volume of 1,000 gal (3,785 L) and a normal operating volume of 700 gal (2,649 L).

Function of the SWMU: This tank collects LLW from hot cells in Building 3026.

Dates of Operation: Date installed: 1950.
Tank is still in service.

Waste Characteristics: Tank W-17 is an active waste collection tank. The waste in the tank is pumped or jetted to the waste storage tanks at a preset time interval, or when the tank is filled. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.42c

SWMU Name: Active LLW Waste Collection Tank—(W-18)

Location of Unit: The ORNL coordinates for the tank are N 22,030 and E 31,700. This tank is located east of the South Tank Farm.

General Dimensions and Capacities: The unit is a vertical stainless steel tank that rests on a concrete slab. The tank is 5.5 ft (1.7 m) in diameter and 7.3 ft (2.2 m) long. The depth from the ground surface to the top of the tank is 9.3 ft (2.8 m). The unit has a volume of 1,000 gal (3,785 L) and a normal operating volume of 700 gal (2,649 L).

Function of the SWMU: This tank collects LLW from hot cells in Building 3026 and liquids from the 3500 Area cell ventilation duct.

Dates of Operation: Date installed: 1950.
Tank is still in service.

Waste Characteristics: Tank W-18 is an active waste collection tank. The waste in the tank is pumped or jetted to the waste storage tanks at a preset time interval, or when the tank is filled. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.43a

SWMU Name: Active LLW Waste Collection/Storage Tank—(W-21)

Location of Unit: The ORNL coordinates for the tank are N 21,935 and E 30,550. This tank is located near Building 2537.

General Dimensions and Capacities: The unit is a horizontal stainless steel tank enclosed in a stainless-steel-lined concrete vault (double containment). The tank is 12.0 ft (3.6 m) in diameter and 60.0 ft (18.3 m) long. The depth from the ground surface to the top of the tank is 20.0 ft (6.1 m). The unit has a volume of 50,000 gal (189,270 L) and a normal operating volume of 40,000 gal (151,416 L).

Function of the SWMU: The unit receives LLW streams from Valve Box No. 1 and Valve Box No. 2 located at the South Tank Farm. The tank functions as a collection and holding tank for feed wastes to the LLW evaporator.

Dates of Operation: Date installed: 1976.
Tank is still in service.

Waste Characteristics: Tank W-21 is an active waste collection tank. The waste in the tank is pumped or jetted to the waste storage tanks at a preset time interval, or when the tank is filled. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0 WAG Name: Main Plant Area

SWMU ID Number: 1.43b SWMU Name: Active LLW Waste Collection/Storage Tank—(W-22)

Location of Unit: The ORNL coordinates for the tank are N 21,935 and E 30,570. This tank is located near Building 2537.

General Dimensions and Capacities: The unit is a horizontal stainless steel tank enclosed in a stainless-steel-lined concrete vault (double containment). The tank is 12.0 ft (3.6 m) in diameter and 60.0 ft (18.3 m) long. The depth from the ground surface to the top of the tank is 20.0 ft (6.1 m). The unit has a volume of 50,000 gal (189,270 L) and a normal operating volume of 40,000 gal (151,416 L).

Function of the SWMU: The unit receives LLW streams from Valve Box No. 1 and Valve Box No. 2 located at the South Tank Farm. The tank functions as a collection and holding tank for feed wastes to the LLW evaporator.

Dates of Operation: Date installed: 1976.
Tank is still in service.

Waste Characteristics: Tank W-22 is an active waste collection tank. The waste in the tank is pumped or jetted to the waste storage tanks at a preset time interval, or when the tank is filled. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.44

SWMU Name: Active LLW Waste Concentrate Tank—(W-23)

Location of Unit: The ORNL coordinates for the tank are N 21,935 and E 30,510. This tank is located at Building 2537.

General Dimensions and Capacities: The unit is a horizontal stainless steel tank enclosed in a stainless-steel-lined concrete vault (double containment). The tank is 12.0 ft in (3.6 m) diameter and 60.0 ft (18.3 m) long. The depth from the ground surface to the top of the tank is 5.5 ft (1.7 m). The unit has a volume of 50,000 gal (189,270 L) and a normal operating volume of 40,000 gal (151,416 L).

Function of the SWMU: The unit receives and stores the concentrated waste from the evaporator facility prior to transfer to tanks W-24–W-31 in Melton Valley.

Dates of Operation: Date installed: 1976.
Tank is still in service.

Waste Characteristics: Tank W-23 is an active waste collection tank. The waste in the tank is pumped or jetted to the waste storage tanks at a preset time interval, or when the tank is filled. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.45a

SWMU Name: Active LLW Waste Concentrate Storage Tank—(C-1)

Location of Unit: The ORNL coordinates for the tank are N 21,820 and E 30,600. This tank is located at Building 2531.

General Dimensions and Capacities: The unit is a horizontal stainless steel tank enclosed in a concrete vault (double containment). The tank is 12.0 ft (3.6 m) in diameter and 60.0 ft (18.3 m) long. The unit has a volume of 50,000 gal (189,270 L) and a normal operating volume of 40,000 gal (151,416 L).

Function of the SWMU: The tank is part of an additional storage system to receive concentrates from the evaporator facility prior to transfer to tank W-23 and then to W-24–W-31 in Melton Valley.

Dates of Operation: Date installed: 1964.
Tank is still in service.

Waste Characteristics: Tank C-1 is an active waste concentrate collection tank. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.45b

SWMU Name: Active LLW Waste Concentrate Storage Tank—(C-2)

Location of Unit: The ORNL coordinates for the tank are N 21,820 and E 30,600. This tank is located at Building 2531.

General Dimensions and Capacities: The unit is a horizontal stainless steel tank enclosed in a concrete vault (double containment). The tank is 12.0 ft (3.6 m) in diameter and 60.0 ft (18.3 m) long. The unit has a volume of 50,000 gal (189,270 L) and a normal operating volume of 40,000 gal (151,416 L).

Function of the SWMU: The tank is part of an additional storage system to receive concentrates from the evaporator facility prior to transfer to tanks W-23 and then to W-24–W-31 in Melton Valley.

Dates of Operation: Date installed: 1964.
Tank is still in service.

Waste Characteristics: Tank C-2 is an active waste collection tank. Because the waste is continuously being collected and discharged, available analyses indicate the contents of the tank only at the time of measurement. In general, the major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU, although some tanks also contain small amounts of uranium and plutonium isotopes. Because of the sample dilutions required to allow handling of radioactive tank liquids, the detection limits are considerably above those required for RCRA hazardous waste determinations. As a result, only limited chemical analyses have been conducted to date. These analyses, however, appear to indicate a greater concern due to radionuclides than to the hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.46

SWMU Name: Solid Waste Storage Area (SWSA) 1—(2624)

Location of Unit: SWSA 1 is located in Bethel Valley at the foot of Haw Ridge, and the closest edge is approximately 25.0 ft (7.6 m) south of White Oak Creek. ORNL grid coordinates are N 20,980 and E 30,710.

General Dimensions and Capacities: The site is triangle shaped and encompasses approximately 1 acre (0.4 ha). It is fenced and grassed.

Function of the SWMU: SWSA 1 was the first area used for burial of low-level solid wastes.

Dates of Operation: Site commissioned: 1943.
Taken out of service: 1944.

Waste Characteristics: The burial ground is contaminated with unknown radionuclides and unidentified chemical constituents. Only a small amount (2,000–4,000 Ci) of solid radioactive waste was buried in SWSA 1.

Release Data: Groundwater movement in the area is to White Oak Creek and is, therefore, monitored via the ORNL Stream Monitoring System. Monitoring activity in 1973 (when water samples were taken from two monitoring wells and a surface seep) indicated a low concentration of Sr-90. In 1975, water samples were taken from two wells and a surface seep and analyzed for Sr-90, Cs-137, and transuranic elements. The results from one well indicated low concentrations of Sr-90 (9.4 dpm/mL) and no indication of Cs-137 or transuranic elements.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.47

SWMU Name: Solid Waste Storage Area (SWSA) 2—(4003)

Location of Unit: SWSA 2 is located on the south side of a hill near the east entrance and main parking area of ORNL, northwest of Building 4500. ORNL grid coordinates are N 22,420 and E 32,310.

General Dimensions and Capacities: The disposal area encompassed approximately 3.5 acres (1.4 ha). It is currently unfenced and has a grass cover.

Function of the SWMU: The area was the second used to dispose of solid waste contaminated with beta or gamma activity, liquid waste contaminated with plutonium in stainless steel drums, and alpha-contaminated material from off-site.

Dates of Operation: Site commissioned: 1944.
Taken out of service: 1946.

Waste Characteristics: The burial site is reported to contain no waste. The burial waste and contaminated soil were moved to another site (SWSA 3) some time after the site was closed in 1946.

Release Data: No significant migration of radionuclides has taken place from SWSA 2. Coring was conducted in 1976 on the site as a part of subsurface investigations for a new building. Analysis of these samples indicated that the soil and water from 25 locations around the site did not contain concentrations of tritium, gross beta, or gross alpha levels that were significantly higher than background samples collected throughout eastern and central Tennessee.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.48

SWMU Name: Low-Level Waste Evaporator—(2531)

Location of Unit: The Low-Level Waste Evaporator is located south of Central Avenue and west of Third Street, close to the South Tank Farm. ORNL grid coordinates are N 21,820 and E 30,600.

General Dimensions and Capacities: Two 600-gal/h (2,270-L/h) evaporators are provided. All stainless steel vessels are contained in reinforced concrete vaults. Sumps and leak detection devices are provided.

Function of the SWMU: The Evaporator is used to concentrate LLW prior to storage or further treatment.

Dates of Operation: Initiated: 1965.
Second evaporator installed in 1979. The site is currently operational.

Waste Characteristics: Feed to the Evaporator is ORNL LLW. Major radionuclides are Sr-90, Cs-137, Co-60, Ru-106, and trivalent rare earths (TRE). Some uranium, plutonium, and TRU are also present.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.49

SWMU Name: Neutralization Facility—(3518)

Location of Unit: The Neutralization Facility is located in the southwest part of ORNL just east of the current PWTP (Building 3544). ORNL grid coordinates are N 21,400 and E 30,900.

General Dimensions and Capacities: Concrete tank is divided into sections. Total capacity is about 40,000 gal (151,416 L).

Function of the SWMU: The main source of wastewater routed to Building 3518 is blowdown from the ORNL steam plant located to the west of the facility.

Dates of Operation: Constructed in the late 1950s, the Neutralization Facility treated the radioactive contaminated process wastewater. In 1979, the PWTP was constructed, and Building 3518 was converted to provide neutralization of wastewater from various ORNL operations.

Waste Characteristics: Waste currently being treated is feed water treatment from the ORNL steam plant. Waste currently being treated is ion exchange regenerant solution from the treatment of ORNL steam plant boiler feed water. The primary species are sulfate ions.

Release Data: Once the wastewater has been neutralized and allowed to pass through the clearwell, it is routed directly to White Oak Creek. The typical flow through the system is 40,000 gal/d (151,416 L/d).

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1 WAG Name: Main Plant Area

SWMU ID Number: 1.50 SWMU Name: PCB Storage Area—(2018 W)

Location of Unit: Storage area is located immediately north of (behind) Building 2018 on the north side of Central Avenue. ORNL grid coordinates are N 22,280 and E 30,320.

General Dimensions and Capacities: The area is surfaced with asphalt and concrete. Dimensions are 70 ft (21 m) by 15 ft (4.5 m).

Function of the SWMU: The unit is designed for temporary storage of PCB-containing materials.

Dates of Operation: Installed: September 1985.
Site is still in use.

Waste Characteristics: The waste consists of PCB-contaminated materials.

Release Data: No releases or spills have been reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.51

SWMU Name: Process Waste Treatment Plant—(3544)

Location of Unit: The site is located inside the main plant area along White Oak Creek. ORNL grid coordinates are N 21,320 and E 30,830.

General Dimensions and Capacities: Average flow rate is about 105 gal/min (397 L/min). Basin 3524 is used to store excess flow during periods of high waste production. Design capacity of plant is 288 gal/d (1,090 L/d). The open, unlined, 750,000-gal (2,835,000-L) basin (3524) provides surge capacity for the plant.

Function of the SWMU: The site is used to treat process waste for removal of Sr-90 and Cs-137. Treatment plant uses a scavenging precipitator–ion exchange (SP–IX) process developed at ORNL. This process involves chemical precipitation, filtration, and ion exchange. Effluent is discharged to White Oak Creek through an NPDES discharge point.

Dates of Operation: Installed: 1976.
Site is still in operation.

Waste Characteristics: Very low-level liquid waste streams are termed process waste and are primarily streams that would contain no radioactivity under normal operations but could become contaminated as a result of equipment failure or human error. Also, due to infiltration of contaminated groundwater into the system and the addition of LLW evaporator overhead, radionuclides are normally detected in the process waste. Major radionuclides are Sr-90 and Cs-137.

Release Data: Ion exchange resin is regenerated with nitric acid, and the solution is concentrated by evaporation and transferred to the low-level waste evaporator facility for storage. Sludge from the clarifier/precipitator is filtered to a dry soild cake, drummed and shipped to K-25 for storage. Treated effluent is released to White Oak Creek through an NPDES discharge point.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.52

SWMU Name: Sewage Treatment Plant—(2521)

Location of Unit: The sanitary wastewater treatment facility, located in Building 2521 at the west end of ORNL near the steam plant, serves a major portion of ORNL. ORNL grid coordinates are N 21,110 and E 29,980.

General Dimensions and Capacities: Capacity of the new plant is 300,000 gal/d (1.1×10^6 L/d).

Function of the SWMU: The facility treats sanitary wastes from the main plant area prior to release to White Oak Creek. In recent years, the previous waste treatment system occasionally failed to meet the discharge limitations of its NPDES permit issued by the EPA. The new extended-aeration activated sludge treatment system consists of an aeration chamber, a clarifier, sludge holding and recirculation equipment, aeration equipment, and sludge piping. Influent to the treatment system is directed to the aeration tank and then to the clarifier. Excess sludge from the clarifier is sent to the sludge holding basin. When sludge wasting is necessary, it is gravity fed to the sludge drying beds. Dewatered sludge is landfilled in SWSA 6.

Dates of Operation: Site commissioned: 1986.
Site is still in operation.

Waste Characteristics: Waste treated is representative of domestic sewage, although infiltration into the sewer system may introduce trace levels of radionuclides. No process wastes are included in the domestic waste.

Release Data: Wastewater effluent from the final clarifier flows to the filter system and then to the existing Parshall flume-chlorine contact structure where it is measured, sampled, and chlorinated prior to discharge to the chlorine contact basin. The existing chlorination system feeds a chlorine solution in the upstream portion of the chlorine contact basin. After sufficient contact time, the basin effluent is discharged into White Oak Creek through an NPDES discharge point.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.53

SWMU Name: Septic Tank for Building 3000—(3078)

Location of Unit: Site is located north of the 3000 substation. ORNL grid coordinates are N 23,100 and E 31,300.

General Dimensions and Capacities: Tank is 36 years old, constructed of concrete, and has a capacity of 580 gal (2,190 L).

Function of the SWMU: Septic tank servicing Building 3000.

Dates of Operation: Site commissioned: 1950.
Site is still in operation.

Waste Characteristics: Wastes are domestic sewage; there is not indication that hazardous or nonhazardous chemical wastes have been discharged to the tank. No radioactive waste was added to tank.

Release Data: No reported leaks or releases.

EPA II.A.1.0 DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

SWMU ID Number: 1.54

SWMU Name: Waste Oil Storage Tanks—(2525)

Location of Unit: The two oil storage tanks are located on the southeast side of Building 2325. ORNL grid coordinates are N 21,930 and E 30,310.

General Dimensions and Capacities: The tanks are steel and located above ground. Each tank has a capacity of 500 gal (1,893 L). Tanks are contained within a 36-in. (91-cm) steel dike.

Function of the SWMU: These units are holding tanks for waste oil. One tank is designed for soluble oils.

Dates of Operation: Site installed: 1984.
Tanks are still in service.

Waste Characteristics: Waste is used oil. When the tanks are filled, oil is transferred to 55-gal drums and stored for recycling.

Release Data: No releases have been reported from these tanks.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 2.0 WAG Name: White Oak Creek/White Oak Lake

SWMU ID Number: 2.1 SWMU Name: White Oak Lake and Embayment (7846)

Location of Unit: This site is located upstream and downstream of White Oak Dam, south of the ORNL main complex, and near Clinch River Mile 20.8 (CRK 33.5). The Dam was built about 0.6 mile (1.0 km) upstream from where White Oak Creek empties into the Clinch River. ORNL grid coordinates of the White Oak Dam are N 15,330 and E 23,360.

General Dimensions and Capacities: The lake forms a body of water about 20 acres (8 ha) in area. Estimated volume in 1979 was 4,589,000 cubic ft (130,000 cubic m).

Function of the SWMU: The site is a surface impoundment for radioactive and other hazardous wastes that drain from ORNL via the White Oak Creek Watershed. It serves as a final settling basin for waste released from ORNL operations and waste storage areas.

Dates of Operation: Site commissioned: 1943.
Site is still operating (after being drained in 1954).

Waste Characteristics: Main radioactive contaminants are Sr-90, Cs-137, Th, U, and TRU. No accurate estimates exist for the inventory of hazardous chemicals in the lake; however, preliminary scoping surveys have shown contamination by Cd and Cr in stream gravels. The average 1985 concentrations of radionuclides in the water discharged at White Oak Dam were Co-60, 63×10^{-9} μCi/mL; Cs-137, 42×10^{-9} μCi/mL; Sr-90, 300×10^{-9} μCi/mL; and H-3, 350×10^{-6} μCi/mL. The lake bed contains an estimated sediment volume of 1.3×10^5 cubic m of sediment, with estimated activities of Cs-137, 591 Ci; Co-60, 33 Ci; and Sr-90, 20 Ci.

Release Data: Total curie discharge from WOD in 1985 was Sr-90 (3.0 Ci), Cs-137 (0.42 Ci), Co-60 (0.62 Ci), and H-3 (3,700 Ci).

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 2.0 WAG Name: White Oak Creek/White Oak Lake

SWMU ID Number: 2.2 SWMU Name: White Oak Creek and Tributaries (0853)

Location of Unit: The site is located in Melton and Bethel valleys, and provides drainage for the ORNL installation. The creek flows into the Clinch River about 1.5 miles (2.4 km) north of the junction of Interstate 40 and State Highway 95.

General Dimensions and Capacities: This system drains an area of 3,830 acres (1,550 ha).

Function of the SWMU: The creek drains the ORNL installation. Treated sewage and process wastes are released to the creek after treatment. LLW after treatment in the PWTP is also discharged to the creek.

Dates of Operation: The creek and its tributaries have been used for waste disposal purposes since ORNL was opened.

Waste Characteristics: Main contaminants are Sr-90, Co-60, Cs-137, H-3, and metals (Hg, Zn, and Cr). Hazardous chemicals, including PCBs, may also be present in the stream sediments. The estimated inventory is Sr-90 (>5.0 Ci), Cs-137 (>100.0 Ci), Pu-239 (0.5 Ci).

Release Data: See SWMU 2.1.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 3.0

WAG Name: Solid Waste Storage Area (SWSA) 3

SWMU ID Number: 3.1

SWMU Name: SWSA 3 (1001)

Location of Unit: SWSA 3 is located in Bethel Valley in a fenced area at the foot of Haw Ridge about 0.6 mile (1.0 km) west of the ORNL complex. ORNL grid coordinates are N 21,760 and E 26,200.

General Dimensions and Capacities: Approximate total area is 7 acres (2.8 ha). It is estimated that 44,000 to 56,000 Ci of radioactive waste was buried in SWSA 3. It is estimated that 600,000 cu ft of LLW was buried.

Function of the SWMU: The site was used as a landfill for the storage of low-level solid radioactive waste. The site was also used to store scrap metal.

Dates of Operation: Site commissioned: 1946.
Taken out of service: 1951.

Waste Characteristics: Little is known about the kinds of wastes stored at this site. Large items were stored aboveground within the fenced-in area. Alpha wastes contained in drums were deposited in concrete-lined trenches and covered with concrete. Beta-gamma wastes were buried in unlined trenches and backfilled with soil.

Release Data: In 1964, well water samples were analyzed and indicated the presence of small amounts of trivalent rare earths (TRE), Sr-90, and H-3. Well water samples collected in 1973 indicated Sr-90 levels up to 3.0 dpm/mL. Soil samples analyzed in 1978 indicated levels higher than natural background. Geologic and hydrologic factors of this area favor a complex pattern of radionuclide movement. Fractures and solution cavities of the limestone represent potential pathways for groundwater movement and radionuclide migration.

A connection from SWSA 3 to Raccoon Creek has also been demonstrated and is thought to represent a solution channel that allows rapid transmission of water during storms. The quantities of radionuclides transported are small.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 3.0

WAG Name: Solid Waste Storage Area (SWSA) 3

SWMU ID Number: 3.2

SWMU Name: Closed Scrap Metal Area (1562)

Location of Unit: A triangle-shaped section (approximately 4 acres [1.6 ha]) is situated south of a portion of the fenced area of SWSA 3 and is called the Scrap Metal Area. ORNL grid coordinates are N 21,270 and E 26,290.

General Dimensions and Capacities: The area covers about 4 acres (1.6 ha).

Function of the SWMU: The purpose of the site was to serve as a storage site for contaminated metal. Most of the scrap has now been buried in other SWSAs (1984), and the area is posted.

Dates of Operation: Site commissioned: 1951.
Site inactive: 1976.

Waste Characteristics: Some contaminated tanks and equipment are still stored aboveground. Tanks may be contaminated. The amount of material stored is not reported.

Release Data: Health Physics surveys of the area indicated that a radioactive tank is buried near the SWSA 3 boundary. One area showed gross radioactivity or Cs-137 levels significantly above background. It is suspected that this contamination came from runoff from SWSA 3. Surveys indicate that contamination of the scrap metal is very low, if present at all.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 3.0

WAG Name: Solid Waste Storage Area (SWSA) 3

SWMU ID Number: 3.3

SWMU Name: Contractors' Landfill—(1554)

Location of Unit: The site is located west of SWSA 3, which is located west of the main ORNL plant area. ORNL grid coordinates are N 21,420 and E 25,000.

General Dimensions and Capacities: The area of the site is approximately 7 acres (2.8 ha). Access is limited by a locked gate.

Function of the Unit: The purpose of the landfill is disposal of debris from construction sites and noncontaminated demolition activities. The site is also used as a disposal area for fly ash from the ORNL steam plant.

Dates of Operation: Opened: 1975.
Site is still in operation.

Waste Characteristics: This facility is now permitted by TDHE. Only noncontaminated debris and construction materials are allowed in the landfill. No hazardous or radioactive wastes are allowed. Prior to permitting, it is believed that similar materials were disposed of in the Contractors' Landfill; however, there is no documentation to support this and it is possible that contaminated soil from construction activities in the main plant was disposed of here. Monthly inspections are conducted to ensure compliance.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 4.0

WAG Name: Solid Waste Storage Area (SWSA) 4

SWMU ID Number: 4.1

SWMU Name: Low-Level Waste Line North of Lagoon Road (7800)

Location of Unit: The site is located along Lagoon Road. ORNL grid coordinates are N 19,880 and E 29,400.

General Dimensions and Capacities: SWMU 4.1 is the LLW transfer line that is located on the north side of Lagoon Road. Line was used to transfer LLW to the Pits and Trenches (WAG 7).

Function of the SWMU: The first 1.5-mile (2.4-km) section of the waste transfer line is 2-in.-diam (5-cm-diam) cast-iron pipe installed in June 1954 to transfer LLW from the Bethel Valley waste storage tanks to Waste Pit 2. Carbon steel extensions to Trench 5 (1960), Trench 6 (1961), and finally to Trench 7 (1962) completed the transfer line to the waste pit area. In 1966, a cast-iron line was installed from Trench 7 to the Old Hydrofracture Facility (1.5 miles). This line was replaced in 1971 by a stainless steel line installed next to the old cast-iron line. This line was taken out of service in 1975.

Dates of Operation: Site commissioned: 1960.
Site inactive: about 1980.

Waste Characteristics: Wastes handled in the transfer system were routinely generated laboratory LLW. Major radionuclides were Sr-90, Cs-137, Ru-106, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams from certain sources. (See waste description entry for SWMU 1.5a for additional details.)

Release Data: Radiation measurements at 3 ft above the ground and at ground surface were systematically made along the entire transfer line with Geiger-Müller (G-M) counters equipped with beta shields. The measurements were made directly above the pipeline and 5 ft (1.5 m) to the right and left of the line. More than 700 readings were made beginning at the hydrofracture site; although three definite areas defining leaks were identified, those areas adjacent to SWSA 4 typically yielded activity rates of only about 0.04 mR/h, thus indicating no leaks detectable at ground level.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 4.0

WAG Name: Solid Waste Storage Area (SWSA 4)

SWMU ID Number: 4.2

SWMU Name: Pilot Pits 1, 2 (7811)

Location of Unit: This site is located south of SWSA 4 on the road leading to the waste pits and trenches. ORNL grid coordinates are N 18,620 and E 26,980.

General Dimensions and Capacities: The area is fenced and paved with asphalt. Approximate size is 150 ft × 150 ft (46 m × 46 m).

Function of the SWMU: The site was originally constructed to perform pilot scale experiments related to fixation of high-level radioactive wastes.

Dates of Operation: As experimental facility: 1955–1959.
The site is now used for storage of equipment and leaching tests on coal and municipal solid wastes.
Site inactive: 1976.

Waste Characteristics: The only radioactivity used at the site was approximately 100 mCi of mixed fission products. This activity was removed. Some sediment cores from a previous Clinch River study are stored at the site, as are certain radionuclides.

Release Data: No reported releases.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 4.0

WAG Name: Solid Waste Storage Area (SWSA) 4

SWMU ID Number: 4.3

SWMU Name: SWSA 4

Location of Unit: Latitude 35.91586, longitude 84.31989. SWSA 4 is located in Melton Valley about 0.5 mile (805 m) southwest of the main ORNL complex. The site is bounded on the northern side by Lagoon Road. ORNL grid coordinates are N 19,220 and E 28,180.

General Dimensions and Capacities: SWSA 4 covers an area of 23 acres (9.3 ha). This landfill was used for about 8.5 years and contains an estimated 2,000,000 cubic ft (57,000 cubic m) of waste.

Function of the SWMU: The unit was a solid waste landfill designed to contain radioactive solid waste. For a period of time, the landfill was designated as the Southern Regional Burial Ground by the Atomic Energy Commission (AEC) and received wastes from nuclear installations in the eastern United States.

Dates of Operation: Site commissioned: February 1951.
Taken out of service: 1959.

Waste Characteristics: Little information exists to characterize the type, concentration, or quantity of radionuclides placed in SWSA 4. Radioactive elements include Sr-90, Cs-137, Co-60, Po-210, H-3, Sb-125, and Pu-239. About 90,000 to 120,000 Ci of waste has been buried, but the actual amount is difficult to assess. Types of waste include paper, glassware, scrap metal, dirt, filters, oils, powders, depleted uranium, animal carcasses, and large pieces of equipment.

Release Data: Much of the waste in SWSA 4 is located in or very near the water table. Principal radionuclides present in groundwater in and near SWSA 4 are H-3 and Sr-90, with occasional readings of Co-60, Sb-125, and Cs-137. SWSA 4 contributes about 35 to 50% of the Sr-90 that is discharged yearly from the WOC basin at White Oak Dam. A surface runoff collector and diversion system was constructed in 1975; a second system was built in 1983. These diversion systems show early indications of reducing Sr-90 releases to WOC. Stream gravel surveys have shown that SWSA 4 is a significant source of Sr-90 and Cs-137.

EPA-II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5.0

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.1a

SWMU Name: LLW Lines and Leak Sites—OHF, Release of Grout

Location of Unit: This site is a spill that resulted from water flowing from an observation well drilled as a part of the fracturing experiments at the OHF. ORNL coordinates are N 17,050 and E 28,620.

General Dimensions and Capacities: No dimensions for the contaminated area have been reported. Amount (volume) of waste spilled is not known.

Function of the SWMU: The well was being drilled as a part of research related to the grout sheets produced at the Old Hydrofracture Facility.

Dates of Operation: Spill reported in 1968.

Waste Characteristics: The waste is water containing Sr-90.

Release Data: Strontium (0.72 Ci) from the well, as measured at monitoring station No. 4 in Melton Branch, accounted for 70% of the total Sr released to the lake.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5.0

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.1b

SWMU Name: LLW Lines and Leak Sites—Building 7852 Hydrofracture Injection Area

Location of Unit: This site is a grout leak at the Old Hydrofracture Facility. See ORNL grid coordinates N 17,200 and E 28,550.

General Dimensions and Capacities: SWMU 5.1b is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is reported to be approximately 2,300 gal (8,700 L) of waste-grout slurry released to the waste pit at the facility.

Function of the SWMU: The leak occurred because a valve failed at the Old Hydrofracture Facility. Waste grout was directed to the waste pit.

Dates of Operation: Date leak occurred: July 31, 1977.

Waste Characteristics: Wastes handled were evaporator concentrated LLW. Major radionuclides were Sr-90, Cs-137, Ru-106, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams.

Release Data: On June 30, 1977 at approximately 3:30 p.m., a valve at the Shale Fracture Facility failed when the waste slurry was being pumped at 130 gal/min to a depth of 820 ft (250 m) at 3,200 psi. An estimated 2,300 gal (8,700 L) of waste slurry leaked into the waste pit designed to handle such events. The injection was terminated. A by-pass was installed around the faulty valve, and the well and the associated pipe system were flushed with water, thereby placing the facility in stand-by condition. All of the valves in the high-pressure system were reinspected and cores, seats, and seals were replaced. The contents of the waste pit were retrieved and included in the injection. The injection was completed on July 2, 1977.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5.0

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.2

SWMU Name: Old Hydrofracture Facility (OHF) Pond (7852A)

Location of Unit: The pond is located at the southwest corner of SWSA 5, near Building 7852. ORNL grid coordinates are N 17,300 and E 28,530.

General Dimensions and Capacities: This site is an unlined pond whose dimensions are 20 × 100 ft (6 × 30 m) with an average depth of about 6.0 ft (1.8 m). Capacity is about 100,000 gal (380,000 L). The sides are lined with limestone rip-rap. The bottom of the pond contains about 15,000 gal (57,000 L) of contaminated sediment.

Function of the SWMU: The pond was designated to receive the accidental release of waste grout mixture in the event of a wellhead rupture.

Dates of Operation: Site commissioned: 1964.
Taken out of service: 1980.

Waste Characteristics: More than 95% of the radioactivity is in the approximately 1-ft-deep sediment. Main radionuclides include Cs-137, Sr-90, Co-60, and Cs-134. Maximum dose rates are 100 and 300 mrad/h at a height of 4 in. (10 cm) above the pond water. Total activity of water, sediment, and clay is 71 mCi, 404 Ci, and 11.7 Ci, respectively.

Release Data: Four quarters of groundwater monitoring indicated that Sr-90 is the major radionuclide contaminating groundwater.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5.0 WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.3 SWMU Name: OHF Site Surface Facilities (7852)

Location of Unit: This site is located 1.0 mile (1.6 km) southwest of the main ORNL complex, in the southwest corner of SWSA 5. ORNL grid coordinates are N 17,160 and E 28,620.

General Dimensions and Capacities: This facility consists of a mixing cell, pump cell, well cell, and transite-roof-covered engine pad (all part of Building 7852). The site also contains three dry storage bins, a water tank, waste pit, and a pump house. Not covered here are the waste storage tanks, (SWMU 5.5) and emergency waste pond (SWMU 5.2).

Function of the SWMU: The function of the OHF is to provide for the permanent disposal of liquid radioactive waste in impermeable shale formations at a depth of about 1,000 ft (300 m). This is accomplished by mixing the radioactive waste with solids (such as cement), forming a grout that can be pumped into shale, where it solidifies in thin sheets.

Dates of Operation: Site commissioned: 1963.
Taken out of service: 1980.

Waste Characteristics: Wastes injected were similar to those discharged to the pits and trenches (evaporator concentrated LLW). Main radionuclides were Sr-90, Cs-137, Co-60, and TRE. No analyses of hazardous constituents are reported. In the control room, absorbed dose rates ranged from 75 to 600 mrad/h, while the maximum transferable beta-gamma activity and alpha activities were 49,000 dpm/100 sq cm and 40 dpm/100 sq cm, respectively. Higher dose rates were observed in the mixing, pump, and well cells.

Release Data: No information exists for releases from this SWMU.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5.0

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.4

SWMU Name: New Hydrofracture Site Surface Facility (7860)

Location of Unit: The New Hydrofracture Facility (Building 7860) is located in Melton Valley about 1 mile (1.6 km) south of the main ORNL facilities in Bethel Valley. The new site is about 800 ft (244 m) south of the original shale fracturing facility, and it is on the south side of Melton Branch and Melton Branch Road. See ORNL coordinates N 16,500 and E 28,180.

General Dimensions and Capacities: The new facility houses the injection cell, a pump cell, a mixing cell, a control room, an emergency waste tank, and service areas. Recently installed LLW storage tanks located adjacent to the site served as the liquid waste feed tanks for the process. The grout is injected into the shale formation at a depth of about 1,000 ft (300 m). The plant is designed to handle 150,000 gal (567,800 L) per injection.

Function of the SWMU: Hydrofracture is a large-scale batch process for the permanent disposal of liquid or slurried radioactive waste. In this process, the waste is mixed with cement and a blend of other solids to form a grout. The grout is then injected into an underground impermeable shale formation and hardens within about 12 h.

Dates of Operation: Facility commissioned: May 1982.
Facility placed on standby: 1985.

Waste Characteristics: The waste was grout in the form of concentrated LLW mixed with cement and a blend of other solids. The source of LLW was evaporator concentrates and sludges removed from the gunite tanks in Bethel Valley.

Release Data: During injection operations, failure of equipment could result in grout being discharged to an underground waste holding tank.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5.0 WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.5a SWMU Name: OHF Waste Storage Tank (T1)

Location of Unit: ORNL coordinates are N 17,170 and E 28,498. The tanks are located at the OHF and are used to store LLW prior to injection.

General Dimensions and Capacities: Tank T1: Outside diameter is 8.0 ft (2.4 m). Length is 44.2 ft (13.5 m). The tank is made of carbon steel. All tanks are covered with 4.0 ft (1.2 m) of soil (minimum) and are cathodically protected.

Function of the SWMU: The site is used to store radioactive waste prior to blending with grout.

Dates of Operation: Site commissioned: 1963.
Taken out of service: 1980.

Waste Characteristics: Major radionuclides are Cs-137, Sr-90, Co-60, and TRU materials. A radiological characterization of the OHF showed that T1 tank may contain 1,000 Ci in 1,100 gal (4,200 L) of sludge.

Release Data: In a direct walk-over survey, the direct beta-gamma absorbed dose rate in the vicinity of the waste storage tanks was less than 1 mrad/h at 0.4 to 1.2 in. (1 to 3 cm) above the surface. No tank leaks have been reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5.0

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.5b

SWMU Name: OHF Waste Storage Tank (T2)

Location of Unit: ORNL grid coordinates are N 17,170 and E 28,510. The tanks are located at the OHF and are used to store LLW prior to injection.

General Dimensions and Capacities: Tank T2: Outside diameter is 8.0 ft (2.4 m). Length is 44.2 ft (13.5 m). The tank is made of carbon steel. All tanks are covered with 4.0 ft (1.2 m) of soil (minimum) and are cathodically protected.

Function of the SWMU: The tank is used to store radioactive waste prior to blending with grout.

Dates of Operation: Site commissioned: 1963.
Taken out of service: 1980.

Waste Characteristics: Major radionuclides are Cs-137, Sr-90, Co-60, and TRU materials. A radiological characterization of the OHF showed that tank T2 may contain 1,000 Ci in 1,100 gal (4,200 L) of sludge.

Release Data: In a direct walk-over survey, the direct beta-gamma absorbed dose rate in the vicinity of the waste storage tanks was less than 1 mrad/h at 0.4 to 1.2 in. (1 to 3 cm) above the surface. No tank leaks have been reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5.0

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.5c

SWMU Name: OHF Waste Storage Tank (T3)

Location of Unit: ORNL grid coordinates are N 17,143 and E 28,540. The tanks are located at the OHF and are used to store LLW prior to injection.

General Dimensions and Capacities: Tank T3: Outside diameter is 10.5 ft (3.2 m). Length is 42.0 ft (12.8 m). The tank is made of carbon steel and rubber lining. All tanks are covered with 4.0 ft (1.2 m) of soil (minimum) and are cathodically protected.

Function of the SWMU: The tank is used to store radioactive waste prior to blending with grout.

Dates of Operation: Site commissioned: 1963.
Taken out of service: 1980.

Waste Characteristics: Major radionuclides are Cs-137, Sr-90, Co-60, and TRU materials. A radiological characterization of the OHF showed that tank T3 may contain 1,000 Ci in 1,300 gal (4,900 L) of sludge.

Release Data: In a direct walk-over survey, the direct beta-gamma absorbed dose rate in the vicinity of the waste storage tanks was less than 1 mrad/h at 0.4 to 1.2 in. (1 to 3 cm) above the surface. No tank leaks have been reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5.0

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.5d

SWMU Name: OHF Waste-Storage Tank (T4)

Location of Unit: ORNL grid coordinates are N 17,140 and E 28,550. The tanks are located at the OHF and are used to store LLW prior to injection.

General Dimensions and Capacities: Tank T4: Outside diameter is 10.5 ft (3.2 m). Length is 42.0 ft (12.8 m). The tank is made of carbon steel and rubber lining. All tanks are covered with 4.0 ft (1.2 m) of soil (minimum) and are cathodically protected.

Function of the SWMU: Used to store radioactive waste prior to blending with grout.

Dates of Operation: Site commissioned: 1963.
Taken out of service: 1980.

Waste Characteristics: Major radionuclides are Cs-137, Sr-90, Co-60, and TRU materials. A radiological characterization of the OHF showed that tank T4 may contain 1,000 Ci in 1,300 gal (4,900 L) of sludge.

Release Data: In a direct walk-over survey, the direct beta-gamma absorbed dose rate in the vicinity of the waste storage tanks was less than 1 mrad/h at 0.4 to 1.2 in. (1 to 3 cm) above the surface. No tank leaks have been reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5.0

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.5e

SWMU Name: OHF Waste Storage Tank (T9)

Location of Unit: ORNL grid coordinates are N 17,170 and E 28,520. The tanks are located at the OHF and are used to store LLW prior to injection.

General Dimensions and Capacities: Tank T9: Outside diameter is 10.0 ft (3.0 m). Length is 19.5 ft (5.9 m). The tank is made of carbon steel (straight side dimensions). All tanks are covered with 4.0 ft (1.2 m) of soil (minimum) and are cathodically protected.

Function of the SWMU: The tank is used to store radioactive waste prior to blending with grout.

Dates of Operation: Site commissioned: 1963.
Taken out of service: 1980.

Waste Characteristics: Major radionuclides are Cs-137, Sr-90, Co-60, and TRU materials. A radiological characterization of the OHF showed that tank T9 may contain 600 Ci in 600 gal (2,200 L) of sludge.

Release Data: In a direct walk-over survey, the direct beta-gamma absorbed dose rate in the vicinity of the waste storage tanks was less than 1 mrad/h at 0.4 to 1.2 in. (1 to 3 cm) above the surface. No tank leaks have been reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5.0

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.6

SWMU Name: Process Waste Sludge Basin (7835)

Location of Unit: The site is located in the northern part of SWSA 5 in Melton Valley. ORNL grid coordinates are N 18,450 and E 30,020.

General Dimensions and Capacities: Dimensions are 85 × 85 ft (26 × 26 m), with a depth of 8 ft (2.4 m). A PVC (polyvinyl chloride) liner covers a compacted clay bottom.

Function of the SWMU: The basin was used to contain and settle sludge produced by the ORNL Process Waste Treatment Plant (3544). Supernatant was pumped back to the PWTP (3544).

Dates of Operation: The basin was constructed in 1976.
Taken out of service: 1981.

Waste Characteristics: Sludge constituents are primarily ferrous sulfate and ferric hydroxide, with fission products present.

Release Data: As much as 50 Ci may be contained in the 4-ft (1.2-m) layer of sediment.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5.0

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.7

SWMU Name: SWSA 5

Location of Unit: Latitude 35.91401, longitude 84.31295. The site is located on a hillside east of WOC, between SWSA 4 and Melton Branch. ORNL grid coordinates are N 17,820 and E 29,560.

General Dimensions and Capacities: SWSA 5 (north and south) is a fenced area of about 80.0 acres (32.3 ha). Land used totals 50.0 acres (20.2 ha). It is estimated that 3.09×10^6 cu ft (86,520 cu m) of waste was buried.

Function of the SWMU: The site is composed of two distinct geographical areas providing different solid waste storage functions. SWSA 5 (south) was used for disposing of routine buried waste; SWSA 5 (north) is used to retrievably store transuranic contaminated waste.

Dates of Operation: Site commissioned: 1959.
Taken out of service: 1973 (except for TRU retrievable storage).

Waste Characteristics: Retrievable wastes are TRU isotopes and U-233. Major wastes are contaminated with Sr-90, Cm-244, Pu-238, Ru-106, Cs-137, Co-60, and H-3. Total inventory is $<2.1 \times 10^5$ Ci.

Release Data: Normal problems caused by infiltration of precipitation were aggravated at SWSA 5 because of poor trench orientation. Fairly high amounts of Sr-90 and measurable amounts of Cm-244 and Pu-238 were detected in one area. Corrective actions were taken. Water from SWSA 5 drains southeast into Melton Branch, and most of the surface water runoff is monitored at Station 4 on Melton Branch. The major contaminants detected in water seepage are Sr-90 and H-3. Average concentration of H-3 was 0.2 mCi/mL.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5.0

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.8a

SWMU Name: LLW Waste Concentrate Storage Tank (W-24)

Location of Unit: The site is located at Building 7830, near the hydrofracture facility in Melton Valley. ORNL grid coordinates are N 16,580 and E 28,030.

General Dimensions and Capacities: The tank measures 12.0 ft (3.7 m) in diameter and 60.0 ft (18.3 m) in length and has a capacity of 50,000 gal (190,000 L). It is a horizontal stainless steel tank in a stainless-steel-lined concrete vault (double containment).

Function of the SWMU: The system of tanks stores the concentrated LLW from the evaporator via tanks W-23, C-1, and C-2. The waste is stored in these tanks until it can be disposed of by a solidification process. Note that the hydrofracture process is currently not in use. The tanks will also be used to receive liquids from the vault sumps from the hydrofracture process.

Dates of Operation: Site commissioned: 1980.
Current status: site is active.

Waste Characteristics: The wastes transferred to these tanks are evaporator concentrates and sludges transferred from the main waste storage tanks in Bethel Valley. Major constituents are Sr-90, Cs-137, Co-60, and TRU. Chemical composition data are reported; however, because of dilution required to allow handling in unshielded facilities, the detection limits are elevated such that most of the analyses are reported as less than the detection limits. Inventory data for radionuclides are available for the tank.

Release Data: These tanks have not been reported to have leaked or spilled wastes.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5.0

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.8b

SWMU Name: LLW Waste Concentrate Storage Tank (W-25)

Location of Unit: The site is located at Building 7830, near the hydrofracture facility in Melton Valley. ORNL grid coordinates are N 16,580 and E 28,030.

General Dimensions and Capacities: The tank measures 12.0 ft (3.7 m) in diameter and 60.0 ft (18.3 m) in length and has a capacity of 50,000 gal (190,000 L). It is a horizontal stainless steel tank in a stainless-steel-lined concrete vault (double containment).

Function of the SWMU: The system of tanks stores the concentrated LLW from the evaporator via tanks W-23, C-1, and C-2. The waste is stored in these tanks until it can be disposed of by a solidification process. Note that the hydrofracture process is currently not in use. The tanks will also be used to receive liquids from the vault sumps and bleedback from the hydrofracture process.

Dates of Operation: Site commissioned: 1980.
Current status: site is active.

Waste Characteristics: The wastes transferred to these tanks are evaporator concentrates and sludges transferred from the main waste storage tanks in Bethel Valley. Major constituents are Sr-90, Cs-137, Co-60, and TRU. Chemical composition data are reported; however, because of dilution required to allow handling in unshielded facilities, the detection limits are elevated such that most of the analyses are reported as less than the detection limits. Inventory data for radionuclides are available for the tank.

Release Data: These tanks have not been reported to have leaked or spilled wastes.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5.0

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.8c

SWMU Name: LLW Waste Concentrate Storage Tank (W-26)

Location of Unit: The site is located at Building 7830, near the hydrofracture facility in Melton Valley. ORNL grid coordinates are N 16,580 and E 28,030.

General Dimensions and Capacities: The tank measures 12.0 ft (3.7 m) in diameter and 60.0 ft (18.3 m) in length and has a capacity of 5,000 gal (190,000 L). It is a horizontal stainless steel tank in a stainless-steel-lined concrete vault (double containment).

Function of the SWMU: The system of tanks stores the concentrated LLW from the evaporator via tanks W-23, C-1, and C-2. The waste is stored in these tanks until it can be disposed of by a solidification process. Note that the hydrofracture process is currently not in use. The tanks will also be used to receive liquids from the vault sumps and bleedback from the hydrofracture process.

Dates of Operation: Site commissioned: 1980.
Current status: site is active.

Waste Characteristics: The wastes transferred to these tanks are evaporator concentrates and sludges transferred from the main waste storage tanks in Bethel Valley. Major constituents are Sr-90, Cs-137, Co-60, and TRU. Chemical composition data are reported; however, because of dilution required to allow handling in unshielded facilities, the detection limits are elevated such that most of the analyses are reported as less than the detection limits. Inventory data for radionuclides are available for the tank.

Release Data: These tanks have not been reported to have leaked or spilled wastes.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5.0

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.8d

SWMU Name: LLW Waste Concentrate Storage Tank (W-27)

Location of Unit: Located at Building 7830, near the hydrofracture facility in Melton Valley. ORNL grid coordinates are N 16,580 and E 28,030.

General Dimensions and Capacities: The tank measures 12.0 ft (3.7 m) in diameter and 60.0 ft (18.3 m) in length and has a capacity of 50,000 gal (190,000 L). It is a horizontal stainless steel tank in a stainless-steel-lined concrete vault (double containment).

Function of the SWMU: The system of tanks stores the concentrated LLW from the evaporator via tanks W-23, C-1, and C-2. The waste is stored in these tanks until it can be disposed of by a solidification process. Note that the hydrofracture process is currently not in use. The tanks will also be used to receive liquids from the vault sumps and bleedback from the hydrofracture process.

Dates of Operation: Site commissioned: 1980.
Current status: site is active.

Waste Characteristics: The wastes transferred to these tanks are evaporator concentrates and sludges transferred from the main waste storage tanks in Bethel Valley. Major constituents are Sr-90, Cs-137, Co-60, and TRU. Chemical composition data are reported; however, because of dilution required to allow handling in unshielded facilities, the detection limits are elevated such that most of the analyses are reported as less than the detection limits. Inventory data for radionuclides are available for the tank.

Release Data: These tanks have not been reported to have leaked or spilled wastes.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5.0

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.8e

SWMU Name: LLW Waste Concentrate Storage Tank (W-28)

Location of Unit: This site is located at Building 7830, near the hydrofracture facility in Melton Valley. ORNL grid coordinates are N 16,580 and E 28,030.

General Dimensions and Capacities: The tank measures 12.0 ft (3.7 m) in diameter and 60.0 ft (18.3 m) in length and has a capacity of 50,000 gal (190,000 L). It is a horizontal stainless steel tank in a stainless-steel-lined concrete vault (double containment).

Function of the SWMU: The system of tanks stores the concentrated LLW from the evaporator via tanks W-23, C-1, and C-2. The waste is stored in these tanks until it can be disposed of by a solidification process. Note that the hydrofracture process is currently not in use. The tanks will also be used to receive liquids from the vault sumps and bleedback from the hydrofracture process.

Dates of Operation: Site commissioned: 1980.
Current status: site is active.

Waste Characteristics: The wastes transferred to these tanks are evaporator concentrates and sludges transferred from the main waste storage tanks in Bethel Valley. Major constituents are Sr-90, Cs-137, Co-60, and TRU. Chemical composition data are reported; however, because of dilution required to allow handling in unshielded facilities, the detection limits are elevated such that most of the analyses are reported as less than the detection limits. Inventory data for radionuclides are available for the tank.

Release Data: These tanks have not been reported to have leaked or spilled wastes.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5.0

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.8f

SWMU Name: LLW Waste Concentrate Storage Tank (W-29)

Location of Unit: The site is located at Building 7830, near the hydrofracture facility in Melton Valley. ORNL grid coordinates are N 16,580 and E 28,030.

General Dimensions and Capacities: The tank measures 12.0 ft (3.7 m) in diameter and 60.0 ft (18.3 m) in length and has a capacity of 50,000 gal (190,000 L). It is a horizontal stainless steel tank in a stainless-steel-lined concrete vault (double containment).

Function of the SWMU: The system of tanks stores the concentrated LLW from the evaporator via tanks W-23, C-1, and C-2. The waste is stored in these tanks until it can be disposed of by a solification process. Note that the hydrofracture process is currently not in use. The tanks will also be used to receive liquids from the vault sumps and bleedback from the hydrofracture process.

Dates of Operation: Site commissioned: 1980.
Current status: site is active.

Waste Characteristics: The wastes transferred to these tanks are evaporator concentrates and sludges transferred from the main waste storage tanks in Bethel Valley. Major constituents are Sr-90, Cs-137, Co-60, and TRU. Chemical composition data are reported; however, because of dilution required to allow handling in unshielded facilities, the detection limits are elevated such that most of the analyses are reported as less than the detection limits. Inventory data for radionuclides are available for the tank.

Release Data: These tanks have not been reported to have leaked or spilled wastes.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5.0

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.8g

SWMU Name: LLW Waste Concentrate Storage Tank (W-30)

Location of Unit: The site is located at Building 7830, near the hydrofracture facility in Melton Valley. ORNL grid coordinates are N 16,580 and E 28,030.

General Dimensions and Capacities: The tank measures 12.0 ft (3.7 m) in diameter and 60.0 ft (18.3 m) in length and has a capacity of 50,000 gal (190,000 L). It is a horizontal stainless steel tank in a stainless-steel-lined concrete vault (double containment).

Function of the SWMU: The system of tanks stores the concentrated LLW from the evaporator via tanks W-23, C-1, and C-2. The waste is stored in these tanks until it can be disposed of by a solidification process. Note that the hydrofracture process is currently not in use. The tanks will also be used to receive liquids from the vault sumps and bleedback from the hydrofracture process.

Dates of Operation: Site commissioned: 1980.
Current status: site is active.

Waste Characteristics: The wastes transferred to these tanks are evaporator concentrates and sludges transferred from the main waste storage tanks in Bethel Valley. Major constituents are Sr-90, Cs-137, Co-60, and TRU. Chemical composition data are reported; however, because of dilution required to allow handling in unshielded facilities, the detection limits are elevated such that most of the analyses are reported as less than the detection limits. Inventory data for radionuclides are available for the tank.

Release Data: These tanks have not been reported to have leaked or spilled wastes.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5.0

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.8h

SWMU Name: LLW Waste Concentrate Storage Tank (W-31)

Location of Unit: The site is located at Building 7830, near the hydrofracture facility in Melton Valley. ORNL grid coordinates are N 16,580 and E 28,030.

General Dimensions and Capacities: The tank measures 12.0 ft (3.7 m) in diameter and 60.0 ft (18.3 m) in length and has a capacity of 50,000 gal (159,000 L). It is a horizontal stainless steel tank in a stainless-steel-lined concrete vault (double containment).

Function of the SWMU: The system of tanks stores the concentrated LLW from the evaporator via tanks W-23, C-1, and C-2. The waste is stored in these tanks until it can be disposed of by a solidification process. Note that the hydrofracture process is currently not in use. The tanks will also be used to receive liquids from the vault sumps and bleedback from the hydrofracture process.

Dates of Operation: Site commissioned: 1980.
Current status: site is active.

Waste Characteristics: The wastes transferred to these tanks are evaporator concentrates and sludges transferred from the main waste storage tanks in Bethel Valley. Major constituents are Sr-90, Cs-137, Co-60, and TRU. Chemical composition data are reported; however, because of dilution required to allow handling in unshielded facilities, the detection limits are elevated such that most of the analyses are reported as less than the detection limits. Inventory data for radionuclides are available for the tank.

Release Data: These tanks have not been reported to have leaked or spilled wastes.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5.0

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.9

SWMU Name: Radioactively Contaminated Waste-Oil Storage Tank (7860A)

Location of Unit: This facility is located in Melton Valley at the New Hydrofracture Facility. See ORNL grid coordinates N 16,450 and E 28,160.

General Dimensions and Capacities: The tank is underground. The tank measures 6.5 ft. (2 m) in diameter by 12 ft (3.7 m) long.

Function of the Unit: The tank is used to store small quantities of waste oil contaminated with radionuclides as a result of use in the pumps and other equipment at the New Hydrofracture Facility.

Dates of Operation: 1982 to 1985.

Waste Characteristics: The waste oil is contaminated with radionuclides. No chemical analysis has been reported.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 5.0

WAG Name: Solid Waste Storage Area (SWSA) 5

SWMU ID Number: 5.10

SWMU Name: TRU Waste Storage Area

Location of Unit: The unit is a portion of SWSA 5 (northern portion). ORNL grid coordinates are N 18,780 and E 29,890.

General Dimensions and Capacities: Estimated area for TRU storage is ~ 10 acres (4.0 ha).

Function of the SWMU: DOE requires that wastes containing concentrations of transuranic nuclides (TRU) above defined limits must be retrievably stored for future off-site disposal in a geologic repository. This site contains a number of different operations in which TRU wastes are retrievably stored consistent with their varying activity levels and other pertinent characteristics.

Dates of Operation: Storage initiated: 1970.
Site is still in operation.

Waste Characteristics: DOE Order 5820.2 defines TRU wastes as those wastes contaminated with greater than 100 nCi/g (or 100 μCi/kg) of radioactive isotopes of atomic number greater than 92 that emit alpha radiation and have half-lives greater than 20 years. These wastes are considered to be sufficiently hazardous to require geologic disposal. Wastes that do not exceed these concentrations are handled on-site as low-level radioactive waste. ORNL also considers U-233 and Ra-226 to be TRU for purposes of waste management due to an evaluation that they represent an "equivalent hazard." These wastes have varying radiation levels and are segregated into contact-handled (less than 200 mrem/h) and remote-handled (greater than 200 mrem/h) wastes. Packaging, handling, and facility design is consistent with the radiation level of the particular waste.

Release Data: No releases have been reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 6.0

WAG Name: Solid Waste Storage Area (SWSA) 6

SWMU ID Number: 6.1

SWMU Name: SWSA 6 (7822)

Location of Unit: Latitude 34.90360, longitude 84.32562. The site is located just northwest of White Oak Lake near White Oak Dam and State Highway 95. See ORNL grid coordinates N 16,670 and E 24,100.

General Dimensions and Capacities: Total fenced area is 68.0 acres (27.5 ha), but only about 14.5 acres (5.9 ha) is usable because of rough terrain. The site contains about 776,600 cubic ft (22,000 cubic m) of solid low-level radioactive waste.

Function of the SWMU: This site is a landfill; its purpose is to contain solid low-level radioactive waste.

Dates of Operation: Site commissioned: 1969.
Site is still in operation.

Waste Characteristics: Hazardous chemicals: lead, toluene, xylene (found in trenches in 1982). Main radionuclides: Co-60, H-3, Sr-90, Cs-137, Eu-152, Eu-154, Eu-155, and U-235 make up 80% of the current inventory of total Ci; a significant amount of U-235 has been emplaced in SWSA 6. Total activity is 251,000 Ci. Highest totals (in Ci) are as follows: Co-60 (32,200), Cs-137 (5,110), Eu-152 (50,900), Eu-154 (72,600), Eu-155 (31,300), H-3 (7,110), Sr-90 (2,970), Th-232 (<2.5), U-233 (227), U-235 (5.6), U-238 (205). These totals are for the period from 1977 to 1984.

Release Data: Groundwater samples collected from 1971 to 1983 show that H-3 is present in some of the down-gradient wells. Only two wells contained significant Sr-90 concentrations above background. Migration of wastes occurs as trenches become filled with water and as runoff increases.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 6.0

WAG Name: Solid Waste Storage Area (SWSA) 6

SWMU ID Number: 6.2

SWMU Name: Emergency Waste Basin—(7821)

Location of Unit: The Emergency Waste Basin is located north of SWSA 6. ORNL grid coordinates are N 18,000 and E 25,110.

General Dimensions and Capacities: The area of the Basin is about 2 acres (0.8 ha). Its volume is reported as 1.5×10^7 gal (5.6×10^7 L).

Function of the SWMU: The basin was constructed as an LLW or process waste holding basin for use when ORNL might be unable to release wastes to White Oak Creek. The basin has never been used.

Dates of Operation: Basin construction: 1961–1962.
No waste has been added to the basin.

Waste Characteristics: No wastes have been added. Water in the basin is the result of runoff from the surrounding areas.

Release Data: No releases have been detected in the stream leaving the basin.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 6.0

WAG Name: Solid Waste Storage Area (SWSA) 6

SWMU ID Number: 6.3

SWMU Name: Explosives Detonation Trench—(7822A)

Location of Unit: This trench is located in the northern part of SWSA 6. ORNL grid coordinates are N 16,835 and E 25,150

General Dimensions and Capacities: This trench is 15 ft (4.6 m) long, 5 ft (1.5 m) wide, and 4 ft (1.2 m) deep.

Function of the SWMU: The site is used to detonate explosives and shock-sensitive chemicals requiring disposal. Waste is laid in the bottom of the trench and detonated with a small plastic explosive charge.

Dates of Operation: The trench is still in operation.

Waste Characteristics: Items detonated at the trench include chemicals such as picric acid, phosphorus, nitromethane, hydrogen peroxide, and ammonium nitrate, as well as others.

Release Data: Chemicals and explosives are destroyed in the resulting explosion. No trend monitoring is performed. As far as can be determined, no releases have occurred.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 7.0

WAG Name: LLW Pits and Trenches Area

SWMU ID Number: 7.1

SWMU Name: Decontamination Facility—(7819)

Location of Unit: The ORNL Decontamination Facility (7819) is located north of Lagoon Road near the entrance to SWSA 4. See ORNL coordinates N 19,330 and E 27,040.

General Dimensions and Capacities: The building is divided into two sections, a Contaminated Zone (C zone) containing two open pits for acid baths and a clean area. Additional decontamination activities were conducted in the back of the building.

Function of the Unit: The facility was used to decontaminate such items as isotope carriers from laboratories and hot cells by means of acid baths and sand blasting.

Dates of Operation: Site commissioned: early 1960s.
Taken out of service: late 1970s.

Waste Characteristics: The contamination consists of the building, equipment, and the land area within a 50-ft (15-m) radius of the building. In a building radiological characterization survey, the radiation exposure rate (beta and gamma) ranged from a maximum of 3.5 R/h (equipment and shelves) in the C zone to < 10 mR/h at floor level in the clean area. Wet towel smears indicated the transferable radioactivities (beta and gamma) at the same locations to be much less (2–27 mR/h, acid bath zone equipment and shelves, and 1–5 mR/h clean area floor level). The uncovered sand used in blast cleaning is located about 40 ft (12 m) from the building and has a maximum exposure rate of 2 mR/h.

Release Data: There are no reported releases, although contamination is present outside the building. Liquid wastes were discharged to Pit 1.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 7.0

WAG Name: LLW Pits and Trenches Area

SWMU ID Number: 7.2

SWMU Name: Homogeneous Reactor Experiment (HRE) Fuel Wells (7809)

Location of Unit: The site is located just south of Trench 5 (latitude 35.90950, longitude 84.32054). ORNL coordinates are as follows:

	(Northing)	(Easting)
S1	17,293.40	26,728.25
S2	17,289.05	26,716.61
S3	17,285.78	26,704.82
S4	17,284.34	26,693.26
S5	17,287.20	26,681.22
S6	17,291.50	26,669.70
S7	17,295.24	26,658.46

General Dimensions and Capacities: At the site are seven auger holes (S1–S7) 1 ft in diameter by 17 ft (5 m) deep. The holes are about 10 ft (3 m) apart. The auger holes received about 135 gal (510 L) of liquid waste.

Function of the Unit: The site was designed to hold residual fuel solution from the Homogenous Reactor. The fuel was stored in the Homogenous Reactor Chemical Plant decay tanks.

Dates of Operation: Site commissioned: 1964.

Waste Characteristics: The fuel wells contain 135 gal (510 L) of 4 molar sulfuric acid solution containing about 10 lb (4.5 kg) of uranium and fission products, Sr-90, and Ru-106. After disposal of the wastes, each well was filled to ground level with soil and marked with a brass plaque bearing well coordinates, liters of waste disposed, and grams of uranium contained in the solution. Uranium content of the wells is S1, 319 g; S2, 528 g; S3, 704 g; S5, 717 g; S6, 730 g; and S7, 260 g.

Release Data: No information reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 7.0

WAG Name: LLW Pits and Trenches Area

SWMU ID Number: 7.3

SWMU Name: Hydrofracture Experimental Site 1, Soil Contamination (HF-S1A)

Location of Unit: Hydrofracture Site 1 is located at ORNL grid coordinates N 18,920 and E 25,890. The injection well is located south of Lagoon Road in an area called the Four Acre Site. (See also SWMU 10.1.)

General Dimensions and Capacities: The area contaminated is not documented, nor is the amount of grout spilled documented. The volume of injection was 27,000 gal (102,200 L) of water, cement, and diatomaceous earth. Depth of injection was 300 ft (91 m).

Function of the SWMU: The spill occurred when the injected grout sheet intercepted a nearby open core hole and overflowed from the core hole. Grout was being injected to investigate the feasibility of using hydrofracturing as a means of LLW disposal.

Dates of Operation: The injection was performed October 1959.

Waste Characteristics: The injection was performed using water, cement, and diatomaceous earth. Grout was tagged with 35 Ci of Cs-137 and 8.7 Ci of Ce-144 prior to injection. No LLW was used. The grout should not contain hazardous constituents other than radioactivity.

Release Data: No information is available on the amount of radioactivity contained in the spilled grout or on the extent of the contamination.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 7.0

WAG Name: LLW Pits and Trenches Area

SWMU ID Number: 7.4a

SWMU Name: LLW Lines and Leak Sites—Gauging Station Northwest of Building 7852

Location of Unit: The leak occurred in the LLW transfer line NW of Building 7852 and approximately 200 ft (61 m) west of WOC. Site is also known as leak site 2. The leak occurred at a mechanical, neoprene-gasketed joint. Leak coordinates are N 17,680 and E 28,000.

General Dimensions and Capacities: This SWMU is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known. This leak is located on the transfer line approximately 200 ft (61 m) west of White Oak Creek. The site drops 15 ft (4.6 m) over a distance of 100 ft (30 m). The waste had seeped from a pipe coupling and had reached ground surface, where it had spread laterally over a small area.

Function of the SWMU: The LLW Line transports evaporator-concentrated low-level radioactive liquid wastes to waste disposal facilities in Melton Valley.

Dates of Operation: The first leak at the site occurred July 9, 1970.

Waste Characteristics: Wastes handled in the transfer system were routinely generated laboratory LLW. Major radionuclides were Sr-90, Cs-137 Ru-106, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams from certain sources. (See waste description entry for SWMU 1.5a for additional details.)

Release Data: The contamination was removed so that there was no significant release of radiation into the creek. The main section of pipe was repaired, pressure tested, and returned to service. During a 1973 survey, contaminated sediment was observed all the way to the creek. Soil samples ranged from 2 Ci/g to a concentration of 3.7 Ci/g. Three groundwater monitoring wells were installed to determine the effect of the leak on groundwater levels. After concluding that the leak was contributing to groundwater contamination, over 3,000 cu ft (84 cu m) of contaminated soil was removed and disposed of. Later, groundwater monitoring showed decreased levels of radionuclide concentrations. A second survey of the area showed elevated readings at this site, suggesting that either additional leakage had occurred or that there had been inadequate removal of the contaminated soil. At 3 ft above the ground surface, beta-gamma activity ranged from 240 mR/h to 800 mR/h along the line. The site has not been entombed with a multilayered cover.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 7.0

WAG Name: LLW Pits and Trenches Area

SWMU ID Number: 7.4b

SWMU Name: LLW Lines and Leak Sites—Pit 6 Southeast (Site 1)

Location of Unit: This leak occurred in the LLW transfer line southeast of Trench 6. The leak is at ORNL grid coordinates N 18,363 and E 27,976.

General Dimensions and Capacities: SWMU 7.4b is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The leak was in the cast-iron LLW transfer line between ORNL and the Old Hydrofracture Faciltiy, approximately 150 ft (45 m) south of Trench 6. The line was used to transfer waste for disposal by hydrofracture.

Dates of Operation: The leak was reported in July 1973 (leak apparently occurred at earlier date). The site was entombed in 1983.

Waste Characteristics: Wastes handled in the transfer system were evaporator-concentrated laboratory LLW. Major radionuclides were Sr-90, Cs-137, Ru-106, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams.

Release Data: Prior to entombment, beta-gamma dose rates measured at 3 ft above ground surface ranged from 240 mR/h to 1R/h. Soil sample analysis revealed significant mixed fission product contamination with concentrations ranging from 0.01 to approximately 50 Ci/g of beta-gamma activity, and gross alpha activities up to 1 mCi/g. Beta-gamma activity was primarily Cs-137 and Sr-90. The primary alpha emitter was Cm-244, with minor concentrations of Am-241, Pu-238, and Pu-239. A multilayer cover was placed over the site, and the area was fenced.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 7.0

WAG Name: LLW Pits and Trenches Area

SWMU ID Number: 7.4c

SWMU Name: LLW Lines and Leaks Sites—End of Trench 7 Access Road (Site 2)

Location of Unit: The leak occurred in a plastic pipe north of Trench 7 (WAG 7).

General Dimensions and Capacities: SWMU 7.4c is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled was approximately 3,000 gal (11,356 L).

Function of the SWMU: The transfer line was designed to transport LLW from Bethel Valley Storage tanks to the Old Hydrofracture Faciltiy.

Dates of Operation: The spill was reported April 1966.

Waste Characteristics: The waste was evaporator concentrated LLW.

Release Data: Near the end of the waste transfer to the trenches, a section of plastic pipeline ruptured, and approximately 3,000 gal (11,356 L) of waste spilled in an area just north of Trench 7. The total activity was estimated at 100 Ci, consisting mainly of Cs and Ce and about 10 Ci of Sr. The contamination was covered with approximately 5 ft (1.5 m) of soil, and the area was contoured to prevent leaching by surface water. None of the contamination was permitted to reach the creek.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 7.0

WAG Name: LLW Pits and Trenches Area

SWMU ID Number: 7.5

SWMU Name: Pit 1 (7805)

Location of Unit: Pit 1 is located just west of SWSA 4 in Melton Valley. ORNL grid coordinates are N 18,830 and E 26,850.

General Dimensions and Capacities: The pit is 100 ft (30 m) long by 20 ft (6 m) wide. Pit 1 is estimated to have held >123,000 gal (465,600 L) of liquid waste.

Function of the SWMU: The purpose of the pit was to hold concentrated liquid waste.

Dates of Operation: The pit received 122,985 gal (465,550 L) of concentrated liquid waste between July and October 1951. It received additional discharges from the decontamination facility (Building 7819) between 1962 and 1964.

Waste Characteristics: The first waste the pit received was very alkaline (pH 12.5) and contained Cs-137, Ru-106, U, and Pu. The estimated radionuclide activities for Cs-137 and Ru-106 are 233 Ci and 156 Ci, respectively. In addition, it is estimated that 432 lb (196 kg) of U and 0.59 lb (266 mg) of Pu was discharged into the pit. The nature of the waste that was discharged into the pit between 1962 and 1964 is unknown; the total activity was probably small.

Release Data: Discharges to the pit were discontinued when a leak was discovered. The leak contained primarily Ru-106.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 7.0

WAG Name: LLW Pits and Trenches Area

SWMU ID Number: 7.6a

SWMU Name: Pit 2 (7806)

Location of Unit: ORNL grid coordinates are N 17,670 and E 26,010. Pit 2 is located just southwest of Pit 1.

General Dimensions and Capacities: Pit 2 is 200 ft (61 m) long and 20 ft (6 m) wide. Pits 2, 3, and 4 have received an estimated 21,001,515 gal (79,500,000 L) of liquid waste.

Function of the SWMU: The pit was built to dispose of liquid waste (LLW).

Dates of Operation: Site commissioned: 1952.
Taken out of service: 1962.

Waste Characteristics: Between 1952 and 1954, the pit received 1,294,443 gal (4,900,000 L) of concentrated liquid waste containing 16,600 Ci of beta activity. After 1955, Pit 2 received overflow through pipes from Pit 3. For this reason, it is not possible to determine the amounts of radioactivity it received after 1955. In 1957, sludge from the older process waste treatment plant was also disposed of in the pit. The amount of radioactivity the pit received from the sludge was relatively small. Between 1959 and 1961 pits 2, 3, and 4 received large discharges of Ru-106, but because of the interconnecting overflow pipes between the pits it is impossible to determine the amount of activity Pit 2 received. It is estimated that pits 2, 3, and 4 together are contaminated with Cs-137, Ru-106, Sr-90, and trivalent rare earths (TRE) having activities of 184,000 Ci; 230,000 Ci; 42,000 Ci; and 70,000 Ci, respectively.

Release Data: The pit seeped Ru-106 during period of operation. Essentially all of the Ru-106 has now decayed. Stream surveys conducted in drainages in the area indicate past contamination by Sr-90 and Co-60.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 7.0

WAG Name: LLW Pits and Trenches Area

SWMU ID Number: 7.6b

SWMU Name: Pit 3 (7807)

Location of Unit: ORNL grid coordiantes are N 17,840 and E 26,290. Pit 3 is located just northeast of Pit 2.

General Dimensions and Capacities: Pit 2 is 200 ft (61 m) long and 20 ft (6 m) wide. Pits 2, 3, and 4 have received an estimated 21,000,000 gal (79,500,000 L) of liquid waste.

Function of the SWMU: The pit was built to dispose of liquid waste (LLW).

Dates of Operation: Site commissioned: 1955.
Site stopped operating: 1961.
Site backfilled and covered with asphalt: 1963.

Waste Characteristics: Because of the interconnecting overflow pipes between pits 2, 3, and 4, it is impossible to determine the amount of activity Pit 3 received. Pits 2 and 3 together probably contain most of the Sr-90 and Cs-137 discharged to all the pits. It is estimated that pits 2, 3, and 4 together are contaminated with Cs-137, Ru-106, Sr-90, and TRE having activities of 184,000 Ci; 230,000 Ci; 42,000 Ci; and 70,000 Ci, respectively.

Release Data: The pit seeped Ru-106 during period of operation. Essentially all of the Ru-106 has now decayed. Stream surveys conducted in drainages in the area indicate past contamination by Sr-90 and Co-60.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 7.0

WAG Name: LLW Pits and Trenches Area

SWMU ID Number: 7.6c

SWMU Name: Pit 4 (7808)

Location of Unit: ORNL grid coordinates are N 17,280 and E 25,970. Pit 4 is located just downhill and south from Pit 2.

General Dimensions and Capacities: Pit 4 is 200 ft (61 m) long and 20 ft (6 m) wide. Pits 2, 3, and 4 have received an estimated 21,000,000 gal (79,500,000 L) of liquid waste.

Function of the SWMU: The pit was built to dispose of liquid waste (LLW).

Dates of Operation: Pit 4 began to receive overflow from Pit 2: 1956.
Taken out of service: 1961.
Backfilled: 1976.
Paved with asphalt: 1980.

Waste Characteristics: Because of the interconnecting overflow pipes between the pits it is impossible to determine the amount of activity Pit 2 received. It is estimated that pits 2, 3, and 4 together are contaminated with Cs-137, Ru-106, Sr-90, and TRE having activities of 184,000 Ci; 230,000 Ci; 42,000 Ci; and 70,000 Ci, respectively.

Release Data: The pit has leakage problems. In 1959 and 1961, interceptor trenches were dug and the liquid was pumped back to the pit.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 7.0

WAG Name: LLW Pits and Trenches Area

SWMU ID Number: 7.7

SWMU Name: Trench 5 (7809)

Location of Unit: ORNL grid coordinates are N 17,470 and E 26,760. Trench 5 is located on a ridgetop perpendicular to strike just east of pits 2, 3, and 4.

General Dimensions and Capacities: Trench 5 is 300 ft (90 m) long by 3 ft wide. It has received an estimated 9,500,000 gal (36,000,000 L) of waste.

Function of the SWMU: The site was built to dispose of liquid waste (LLW).

Dates of Operation: The trench was constructed in 1960 and used until 1961. It was paved with an asphalt cover in 1970.

Waste Characteristics: Trench 5 has received Cs-137, Ru-106, Sr-89 and Sr-90 and Co-60, with radionuclide activities of 205,600 Ci, 96,750 Ci, and 3,045 Ci respectively. Between 1960 and 1966, the trench received about 3,962 gal (15,000 L) per day of liquid waste.

Release Data: No visual leakage has been observed from this trench.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 7.0

WAG Name: LLW Pits and Trenches Area

SWMU ID Number: 7.8

SWMU Name: Trench 6 (7810)

Location of Unit: ORNL grid coordinates are N 18,680 and E 27,980. Trench 6 is located on a ridgetop just south of SWSA 4.

General Dimensions and Capacities: Trench 6 is 500 ft (154 m) long by 3.3 ft (1 m) wide. It has received an estimated 180,000 gal (681,000 L) of liquid waste.

Function of the SWMU: The site was built to dispose of liquid waste (LLW).

Dates of Operation: Trench 6 was constructed in 1961. Because of severe leakage problems, it was used for only about 1 month. It was paved with an asphalt cover in 1981.

Waste Characteristics: Trench 6 has received Cs-137, Ru-106, Sr-90, and Co-60, with radionuclide activities of 665 Ci, 501 Ci, 145 Ci, and 24 Ci, respectively.

Release Data: The trench had severe Sr-90 and Cs-137 leakage problems when it was first put into service. For this reason, it was only used about 1 month.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 7.0

WAG Name: LLW Pits and Trenches Area

SWMU ID Number: 7.9

SWMU Name: Trench 7 (7818)

Location of Unit: ORNL grid coordinates are N 17,440 and E 27,600. Trench 7 is located east of Trench 5.

General Dimensions and Capacities: Trench 7 is 200 ft (60 m) long by 3 ft wide. It has received an estimated 9,500,000 gal (36,000,000 L) of liquid waste.

Function of the SWMU: The site was built to dispose of liquid waste (LLW).

Dates of Operation: Trench 7 was built in 1962. It was used unitl 1966 and paved with asphalt in 1970.

Waste Characteristics: Trench 7 has received Cs-137, Ru-106, Sr-90, and Co-60, with radionuclide activities of 231,000 Ci, 3,400 Ci, 48,000 Ci, and 1,500 Ci, respectively.

Release Data: Trench 7 has received more extensive study recently than the other pits and trenches. Little Sr-90 and Cs-137 has been found in groundwater in the vicinity of Trench 7. The lack of Sr-90 mobility is attributed to alkaline treatment of the trench, and the lack of Cs-137 mobility is attributed to irreversible sorption to illite. However, the treatments to retain Sr-90 may have increased the mobility of U-233, H-3, Co-60, and Tc-99. High concentrations of Tc-99 were found in groundwater and leaves of trees whose roots are apparently very efficient at extracting Tc-99 from the soil and groundwater. Pu-238, Pu-239, and Pu-240 have also been found in soil near Trench 7. The progressive enrichment of Pu-238 and Pu-240 relative to Pu-239 with distance from the trench suggests that much of the Pu contamination in the surrounding soils has resulted from the migration of Cm-242 and Cm-244 and their subsequent decay to Pu-238 and Pu-240, respectively, rather than from the migration of plutonium.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 7.0

WAG Name: LLW Pits and Trenches Area

SWMU ID Number: 7.10

SWMU Name: Shielded Transfer Tanks (ST1, ST2, ST3, ST4, ST5)

Location of Unit: See ORNL grid coordinates N 18,500 and E 26,670. These tanks consist of four Model II tanks designed as RD-C-43, RD-C-44, RD-C-47, RD-C-48, and one Model III tank referred to as the Gun Barrel Tank. Tanks RD-C-43, RD-C-47, RD-C-48, RD-C-44, and the Model III tank are located in a fenced storage yard on the west end of SWSA 4.

General Dimensions and Capacities: The Model II tanks consist of a 500-gal (1,900-L) 0.4-in.-thick (1.0-cm-thick) stainless steel liner surrounded with 3.5 in. (9 cm) of lead shielding encased in a 0.75-in. (2-cm) steel outer shell. The vessels contain approximately 395 gal (1,500 L) of Decalso inorganic ion exchange medium. Tank RD-C-44 is reported to be empty. The Model III tank consists of a 198-gal (750-L) stainless steel liner encased in 9 in. (23 cm) of steel. The vessel contains approximately 148 gal (560 L) of AW-500 inorganic ion-exchange medium.

Function of the SWMU: These tanks were used to ship Cs-137–loaded ion exchange resins to ORNL from Richland, Washington.

Dates of Operation: The tanks were used during the 1960s.

Waste Characteristics: The tanks are contaminated with Cs-137. Results from a beta-gamma probe for tanks RD-C-43, RD-C-44, RD-C-47, RD-C-48, and the Gun Barrel Tank gave readings of 2–3 mrad/h, 3–5 mrad/h, 2–3 mrad/h, spots of 10–20 mrad/h, and 2 mrad/h, respectively. Tank RD-C-44 had one spot that gave a reading of 20 mrad/h. Estimated inventory is Cs-137 (2,000 Ci).

Release Data: There is no direct evidence of any leakage.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 8.0 WAG Name: Melton Valley Area

SWMU ID Number: 8.1a SWMU Name: HFIR/TRU Waste Collection Basin—(7905)

Location of Unit: The unit is located south of the High Flux Isotope Reactor (HFIR) at the Melton Valley ORNL facilities complex. ORNL grid coordinates are N 16,740 and E 32,620.

General Dimensions and Capacities: The site is an unlined waste collection basin. Capacity: 240,000 gal (900,000 L). Dimensions: 86 × 116 ft (26 × 35 m) at the top of the berm and 40 × 70 ft (12 × 21 m) at the bottom of the pond. Maximum depth is 7.0 ft (2.1 m). Elevation at the top of the pond is 804 ft (245 m) MSL.

Function of the SWMU: This basin is often called the Cold Pond and is used as an intermediate storage and collection basin for liquid wastes from the HFIR facility. The basin also serves as an emergency storage basin for the radiologically contaminated blowdown water from the cooling tower in Building 7902. The waste streams collected consist of flow drain, laboratory drains, steam condensates, process vessel cooling water, and precipitation falling directly on the basin.

Dates of Operation: Site commissioned: 1965.
Site is still in use.

Waste Characteristics: Wastes streams consist of floor drains, laboratory drains, stream condensates, and process vessel cooling water containing nitric acid, sodium hydroxide, and sulfuric acid. Co-60 is the major radionuclide present. Recent sludge analysis indicates that none of the data for metals, pesticides, or herbicides exceeded the maximum concentrations of contaminants for the characteristics of EP toxicity. Among the non-EP-TOX limited volatile organics, only a few were identified as present above the analytical detection limits. There is about 12 in. (30 cm) of sludge in the pond.

Release Data: Effluent from the pond is released to Melton Branch or pumped to the Equalization Basin (3524) in Bethel Valley for treatment. Because the pond is not lined, some leakage probably occurs. For example, four quarters of groundwater monitoring have shown significantly higher levels of Mn, Na, sulfate, nitrate, gross alpha, and gross beta in groundwater downgradient as compared to groundwater upgradient of the basin. No accidental releases from the pond are reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 8.0

WAG Name: Melton Valley Area

SWMU ID Number: 8.1b

SWMU Name: HFIR/TRU Waste Collection Basin—(7906)

Location of Unit: The unit is located south of the High Flux Isotope Reactor (HFIR) at the Melton Valley, ORNL facilities complex. ORNL grid coordinates are N 16,700 and E 32,490.

General Dimensions and Capacities: This site is an unlined waste collection basin. Capacity: 500,000 gal (1,890,000 L). Dimensions: 167 × 116 ft (51 × 35 m) at top and 121 × 70 ft (37 × 21 m) at bottom. Average sediment depth is about 8 in. (20 cm).

Function of the SWMU: In addition to receiving liquid wastes from HFIR, Basin 7906 can also receive diverted waste streams from TURF and the Transuranium Processing Plant (TRU). This basin is called the Hot Pond because it receives wastes that are thought to contain radiation.

Dates of Operation: Site commissioned: 1965.
Site is still in operation.

Waste Characteristics: Contaminants from the TRU and TURF facilities (if released) are primarily plutonium and daughter nuclides with alpha-emitting particles and atomic weights greater than 93. The major radionuclide from the HFIR is Co-60. Nonradioactive wastes include sodium and potassium hydroxide and acids. Recent sludge analysis indicates that none of the data for metals, pesticides, or herbicides exceeded the maximum concentrations of contaminants for the characteristics of EP toxicity.

Release Data: Basins 7905, 7906, 7907, and 7908 are reported to contain less than 10 Ci of radioactivity. Effluent from the basin is released to Melton Branch or pumped to the Equalization Basin (3524) for treatment. No accidental releases from the pond are reported. Four quarters of groundwater monitoring have indicated significantly higher levels of Mn, Na, nitrate, sulfate, and gross beta activity in a groundwater well downgradient as compared to upgradient of the basin.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 8.0 WAG Name: Melton Valley Area

SWMU ID Number: 8.1c SWMU Name: HFIR/TRU Waste Collection Basin—(7907)

Location of Unit: The site is located south of Building 7900 (HFIR) in Melton Valley. ORNL grid coordinates are N 16,680 and E 32,380.

General Dimensions and Capacities: This site is an unlined waste collection basin. Capacity: 50,000 gal (180,000 L). Dimensions: 60 × 80 ft (12 × 24 m) at the top of the berm; depth is about 11 ft (3.4 m). Average depth of sediments is 2.4 in. (6.0 cm).

Function of the SWMU: The basin is designed to receive process waste streams from the TRU. During operation, Basin 7907 is filled and emptied alternately with Basin 7908. Waste streams are derived from floor drains, laboratory drains, steam condensates, and process vessel cooling waters. The basin is also called the Number 3 Pond or the TRU A Pond.

Dates of Operation: Site commissioned: 1965.
Site is still in operation.

Waste Characteristics: The major radionuclide in the process waste is Cm-244. Recent sludge analyses indicate that none of the data for metals or pesticides and herbicides exceeded the maximum concentration of contaminants for characteristics of EP Toxicity.

Release Data: If radioactive contamination is detected, the wastes are pumped to Basin 3524 in the ORNL Bethel Valley complex. Noncontaminated water is discharged to Melton Branch. No accidental releases from the pond are reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 8.0 WAG Name: Melton Valley Area

SWMU ID Number: 8.1d SWMU Name: HFIR/TRU Waste Collection Basin—(7908)

Location of Unit: The site is located south of Building 7900 (HFIR) in Melton Valley. ORNL grid coordinates are N 16,660 and E 32,310.

General Dimensions and Capacities: The site is an unlined waste collection basin. Capacity: 50,000 gal (180,000 L). Dimensions: 60 × 80 ft (12 × 24 m) at the top of the berm; depth is about 11 ft (3.4 m). Average depth of sediments is 2.4 in. (6.0 cm).

Function of the SWMU: The basin is designed to receive process waste streams from the TRU. During operation, Basin 7908 is filled and emptied alternately with Basin 7907. Waste streams are derived from floor drains, laboratory drains, steam condensates, and process vessel cooling waters.

Dates of Operation: Site commissioned: 1965.
Site is still in operation.

Waste Characteristics: The major radionuclide in the process waste is Cm-244. Recent sludge analyses indicate that none of the data for metals or pesticides and herbicides exceeded the maximum concentration of contaminants for characteristics of EP Toxicity, and only a few of the organics exceeded detection limits.

Release Data: If radioactive contamination is detected, the wastes are pumped to Basin 3524 in the ORNL Bethel Valley complex. Noncontaminated water is discharged to Melton Branch. No accidental releases from the pond are reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 8.0

WAG Name: Melton Valley Area

SWMU ID Number: 8.2

SWMU Name: Hydrofracture Experimental Site 2, Soil Contamination (HF-S2A)

Location of Unit: The injection well for Hydrofracture Experimental Site 2 is located at ORNL grid coordinates N 16,817 and E 31,260.

General Dimensions and Capacities: Two injections were performed. The first was at a depth of 934 ft (285 m) and used 91,567 gal (346,618 L) of grout tagged with 25 Ci Cs-137, and the second at 695 ft (212 m) used 132,700 gal (502,324 L) of grout and 25 Ci of Cs-137.

Function of the SWMU: This site was the second test facility for testing the use of hydrofracturing as a method of LLW disposal. It was set up so that a deeper injection well could be used in an area of known geology.

Dates of Operation: Two injections were performed on September 3 and 10, 1960.

Waste Characteristics: Both of these tests were also conducted with a grout made of water and grout additives. A total of 50 Ci of Cs-137 was injected. No hazardous chemicals other than the radioactivity were added.

Release Data: No records can be found indicating any spills or leakage at this site. The injection well is currently covered by a road.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 8.0

WAG Name: Melton Valley Area

SWMU ID Number: 8.3a

SWMU Name: LLW Lines and Leak Sites—Lagoon Road and Melton Valley Drive

Location of Unit: This site was due to a break in the transfer line at the Lagoon Road and Melton Valley Drive intersection, where the transfer line crosses White Oak Creek near the bridge to the 7500 Area.

General Dimensions and Capacities: SWMU 8.3a is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The Melton Valley transfer line was installed to allow wastes generated in buildings 7500 (HRE, now NSPP) and 7503 (MSRE) to be pumped to the main plant storage tanks and the evaporator prior to disposal.

Dates of Operation: LLW transfer system commissioned: June 1954.
Site leak date: April–June 1960.

Waste Characteristics: Wastes handled in the collection system were routinely generated laboratory LLW. Major radionuclides were Sr-90, Cs-137, Ru-106, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams.

Release Data: The break was due to damage by heavy equipment. The leak did not result in a serious hazard but could have seriously contaminated the creek if it had occurred at a time when waste transfer was being made. An inspection of the line at the creek, while repairs were in progress, indicated that there may have been other leaks in the line.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 8.0

WAG Name: Melton Valley Area

SWMU ID Number: 8.3b

SWMU Name: LLW Lines and Leak Sites—Melton Valley Drive and SWSA 5 Access Road

Location of Unit: This site was located in the transfer line near the Melton Valley Drive and SWSA 5 Access Road intersection. One of the two leaks this site labels was between the Melton Valley pumping station and the South Tank Farm at the entrance to SWSA 5. Both failures occurred at mechanical, neoprene-gasketed pipe joints.

General Dimensions and Capacities: SWMU 8.3b is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The main plant area LLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLW lines; others are along the lines themselves; and still others are not leaks at all but are spills, e.g., from pumping accidents.

Dates of Operation: LLW transfer system commissioned: June 1954.
Site leak date: July 9 and 31, 1970.

Waste Characteristics: Wastes handled in the collection system were routinely generated laboratory LLW. Major radionuclides were Sr-90, Cs-137, Ru-106, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams.

Release Data: The contamination in both locations was removed so that there was no significant release of activity into the creek. The main section of pipe was repaired, pressure tested, and returned to service.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 8.0

WAG Name: Melton Valley Area

SWMU ID Number: 8.3c

SWMU Name: ORNL Lines and Leak Sites—7500 Area

Location of Unit: This site is located in the area north of the Nuclear Safety Pilot Plant (NSPP), Building 7500. The spill occurred when a coupling failed in the waste transfer line.

General Dimensions and Capacities: SWMU 8.3c is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled was reported to be 2,100 gal (7,950 L).

Function of the SWMU: The Melton Valley waste transfer line was used to transport LLW from Melton Valley reactor facilities to the main ORNL plant area for storage and treatment prior to disposal.

Dates of Operation: Site leak date: July 1969.

Waste Characteristics: Wastes handled in the collection system were routinely generated laboratory LLW. Major radionuclides were Sr-90, Cs-137, Ru-106, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams. The contamination was Cm-244 and a mixture of fission products.

Release Data: A 2,100-gal (7,950-L) spill occurred when a coupling in the waste transfer line failed. The contamination was cleaned up in about two weeks. The amount of radioactivity released into the Clinch River from the spill was not significant. In another spill that occurred, the purge water from the hot storage pool in Building 7500 was discharged to the ground and flowed along natural drainage east of Building 7500.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 8.0

WAG Name: Melton Valley Area

SWMU ID Number: 8.3d

SWMU Name: LLW Lines and Leak Sites—West of Melton Valley Pumping Station

Location of Unit: This site is located west of the Melton Valley Pumping Station.

General Dimensions and Capacities: The transfer line is a 2-in. (5-cm) stainless steel line.

Function of the SWMU: This line was used to transfer liquid waste from Melton Valley to the Tank Farm.

Dates of Operation: Site leak date: January 15, 1971.

Waste Characteristics: Wastes handled in the collection system were routinely generated laboratory LLW. Major radionuclides were Sr-90, Cs-137, Ru-106, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams. (See waste description entry for SWMU 1.5a for additional details.)

Release Data: A 100-sq-ft (9-sq-m) area was contaminated while liquid waste was being transferred from Melton Valley to the Tank Farm. The area was subsequently excavated. There was no spread of contamination outside the immediate area and no contamination of personnel. Exposures were not beyond normal working limits.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 8.0

WAG Name: Melton Valley Area

SWMU ID Number: 8.3e

SWMU Name: ORNL Lines and Leak Sites—Building 7920 and Melton Valley Pumping Station Area

Location of Unit: This site is on the transfer line between the Melton Valley Pumping Station and the Transuranium Processing Plant, Building 7920.

General Dimensions and Capacities: SWMU 8.3e is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The transfer line is used to transport waste from the Transuranium Processing Plant (Building 7920) to the Melton Valley Pumping Station and then to the main ORNL plant area.

Dates of Operation: Site leak date: July 1980.

Waste Characteristics: Wastes handled in the collection system were routinely generated laboratory LLW. Major radionuclides were Sr-90, Cs-137, Ru-106, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams. (See waste description entry for SWMU 1.5a for additional details.)

Release Data: The leak occurred at a mechanical, neoprene-gasketed pipe joint in the transfer line. The contamination was removed so that there was no significant release of activity into the creek. The line from the Transuranium Processing Plant could not pass the pressure test after the repairs were made and was removed from service. It was replaced, on an emergency basis, with a new line.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 8.0

WAG Name: Melton Valley Area

SWMU ID Number: 8.3f

SWMU Name: ORNL Lines and Leak Sites—7920 Ditch Line

Location of Unit: This site is in the LLW line from the Transuranium Processing Plant (Building 7920) along the HFIR access road.

General Dimensions and Capacities: SWMU 8.3f is a leak/spill site. No dimensions are available, and the amount of waste leaked or spilled is not known.

Function of the SWMU: The transfer line transports waste from Building 7920 to the Melton Valley Pumping Station.

Dates of Operation: Date leak reported: January 31, 1972.

Waste Characteristics: Wastes handled in the collection system were routinely generated laboratory LLW. Major radionuclides were Sr-90, Cs-137, Ru-106, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams. (See waste description entry for SWMU 1.5a for additional details.)

Release Data: The liquid from this leak crossed under the road through the culverts and flowed along the natural drainage parallel to Melton Branch Circle in a southerly direction.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 8.0

WAG Name: Melton Valley Area

SWMU ID Number: 8.3g

SWMU Name: ORNL Lines and Leak Sites—The Melton Valley Transfer Line

Location of Unit: The old pipeline ran parallel to Melton Valley Drive to the Melton Valley Pumping Station and then extended south to the TRU and HFIR facilities.

General Dimensions and Capacities: The new line replaces an earlier cast-iron line and is a 2-in.-diam (5-cm-diam) stainless steel line with a cathodic protection system. The original transfer line was a flanged and gasketed carbon steel pipeline.

Function of the SWMU: The new line connects the Melton Valley Pumping Station to the evaporator service tanks.

Dates of Operation: LLW transfer system commissioned: June 1954.
Date line replaced: 1973.

Waste Characteristics: Wastes handled in the collection system were routinely generated laboratory LLW. Major radionuclides were Sr-90, Cs-137, Ru-106, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes were also present in the waste streams from certain sources.

Release Data: A new line connecting the Melton Valley Pumping Station to the evaporator service tanks was installed in 1973.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 8.0

WAG Name: Melton Valley Area

SWMU ID Number: 8.4

SWMU Name: Hazardous Waste Storage Facility—(7507)

Location of Unit: This facility is located adjacent to the MSRE site. ORNL grid coordinates are N 18,640 and E 32,640.

General Dimensions and Capacities: The building area is about 1,467 sq ft (136 sq m) and is constructed of metal siding. Storage is restricted to not more than 200 drums/containers. Normal loading is 130 drums/containers.

Function of the SWMU: The site is used to store hazardous waste material. It is currently registered with the state of Tennessee and EPA as an interim-status hazardous waste storage facility.

Dates of Operation: Initiation of storage: 1981.
Operation will terminate when Building 7652 is operable.

Waste Characteristics: Hazardous wastes are stored within the building pending shipment to an EPA-permitted commercial facility for treatment/disposal. Wastes include laboratory chemical wastes; ignitable, corrosive, and/or EP toxic wastes; or PCB liquids and solids.

Release Data: No releases have been reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 8.0

WAG Name: Melton Valley Area

SWMU ID Number: 8.5

SWMU Name: Active LLW Collection and Storage Tank—(WC-20)

Location of Unit: The ORNL coordinates for the unit are N 19,000 and E 32,600. This tank is located in Melton Valley.

General Dimensions and Capacities: The unit is a horizontal stainless steel tank set in a stainless-steel-lined concrete vault (double containment). It is 10 ft (3 m) in diameter, 19.0 ft (5.9 m) in length and is 7.5 ft (2.3 m) below the surface of the ground. It has a volume of 10,000 gal (37,854 L) and a normal operating volume of 7,000 gal (26,497 L).

Function of the SWMU: The tank receives waste from Building 7920. It discharges to Building 7567.

Dates of Operation: Date installed: 1976.
Tank is still in service.

Waste Characteristics: No analysis of the waste has been reported. Major radionuclides of concern in LLW are considered to be Sr-90, Cs-137, Co-60, and TRU. Various short–half-life radionuclides and some uranium or plutonium isotopes may also be contained in the waste. Initial chemical analysis of LLW indicates that radionuclides are of greater concern than hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 8.0

WAG Name: Melton Valley Area

SWMU ID Number: 8.6

SWMU Name: Active LLW Collection/Storage Tank—(HFIR)

Location of Unit: The ORNL coordinates for the tank are N 16,990 and E 32,300. This is located southeast of Building 7510 in Melton Valley.

General Dimensions and Capacities: The unit is a horizontal stainless steel tank.The tank is 8.0 ft (2.4 m) in diameter and 35.0 ft (10.7 m) long. The depth from the ground surface to the top of the tank is 19.0 ft (5.8 m). The unit has a volume of 13,000 gal (49,210 L) and a normal operating volume of 9,100 gal (34,450 L).

Function of the SWMU: The tank collects low-level waste from Building 7900. It discharges to tanks T1 and T2 through a 3-in.-diam (7.6-mm-diam) cast-iron mechanical joint line.

Dates of Operation: Date installed: 1976.
Tank is still in service.

Waste Characteristics: No analysis of the waste has been reported. Major radionuclides of concern in LLW are considered to be Sr-90, Cs-137, Co-60, and TRU. Various short-half-life radionuclides and some uranium or plutonium isotopes may also be contained in the waste. Initial chemical analysis of LLW indicates that radionuclides are of greater concern than hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 8.0

WAG Name: Melton Valley Area

SWMU ID Number: 8.7a

SWMU Name: Active LLW Collection/Storage Tank—(T-1)

Location of Unit: The ORNL coordinates for the tank are N 18,780 and E 32,415. It is located west of Building 7567 in Melton Valley.

General Dimensions and Capacities: The unit is a horizontal stainless steel tank. The tank is 10 ft (3 m) in diameter and 27.5 ft (8.4 m) long. The depth from the ground surface to the top of the tank is 6.6 ft (2.0 m). The unit has a volume of 15,000 gal (56,781 L) and a normal operating volume of 10,500 (39,746 L).

Function of the SWMU: The tank collects LLW from buildings 7500, 7502, 7503, and the HFIR tank. It discharges to Building 7567.

Dates of Operation: Date installed: 1976.
Tank is still in service.

Waste Characteristics: No analysis of the waste has been reported. Major radionuclides of concern in LLW are considered to be Sr-90, Cs-137, Co-60, and TRU. Various short-half-life radionuclides and some uranium or plutonium isotopes may also be contained in the waste. Initial chemical analysis of LLW indicates that radionuclides are of greater concern than hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 8.0

WAG Name: Melton Valley Area

SWMU ID Number: 8.7b

SWMU Name: Active LLW Collection/Storage Tank—(T-2)

Location of Unit: The ORNL coordinates for the tank are N 18,780 and E 32,430. It is located west of Building 7567 in Melton Valley.

General Dimensions and Capacities: The unit is a horizontal stainless steel tank. The tank is 10 ft (3 m) in diameter and 27.5 ft (8.4 m) long. The depth from the ground surface to the top of the tank is 6.6 ft (2.0 m). The unit has a volume of 15,000 gal (56,781 L) and a normal operating volume of 10,500 gal (39,746 L).

Function of the SWMU: The tank collects LLW waste from buildings 7500, 7502, 7503, and the HFIR tank. It discharges to Building 7567.

Dates of Operation: Tank installed: 1976.
Tank is still in service.

Waste Characteristics: No analysis of the waste has been reported. Major radionuclides of concern in LLW are considered to be Sr-90, Cs-137, Co-60, and TRU. Various short-half-life radionuclides and some uranium or plutonium isotopes may also be contained in the waste. Initial chemical analysis of LLW indicates that radionuclides are of greater concern than hazardous waste constituents.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 8.0

WAG Name: Melton Valley Area

SWMU ID Number: 8.8

SWMU Name: Mixed Waste Storage Pad (7507W)

Location of Unit: The Mixed Waste Storage Pad is located due west of Building 7507 (see SWMU 8.4). ORNL grid coordinates are N 18,600 and E 32,600.

General Dimensions and Capacities: The pad measures approximately 40 × 40 ft (12 × 12 m). It is concrete with dikes and a sump.

Function of the SWMU: Mixed radioactive and hazardous chemical wastes are stored on the pad until a resolution is reached relative to the final disposal of this material or until a facility becomes available. This material will be transferred to the Long-Term Hazardous Waste Storage Facility (Bldg. 7654) when it is completed.

Dates of Operation: Storage initiated: unknown.
Site is still in operation.

Waste Characteristics: All waste is placed in drums.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 8.0

WAG Name: Melton Valley Area

SWMU ID Number: 8.9

SWMU Name: Sewage Treatment Plant (7904)

Location of Unit: ORNL grid coordinates are N 16,860 and E 32,580. The plant services the High Flux Isotope Reactor (HFIR) facilities.

General Dimensions and Capacities: The treatment plant had a rated capacity of 7,500 gal/d (28,390 L/d). Main tank capacity is 13,200 gal (49,970 L).

Function of the SWMU: This site treats domestic sewage generated in the HFIR complex. Weak sewage caused continuous operational problems. In 1977, the treatment plant was converted into a sewage holding tank from which the sewage is collected in a tank truck and transferred to the ORNL sewage treatment plant.

Dates of Operation: The site was installed in 1962.
It is still in service (used as collecting tank since 1977).

Waste Characteristics: Waste handled is domestic sewage; no hazardous or radioactive wastes have been added to the system.

Release Data: No reported leaks or releases.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 8.0 WAG Name: Melton Valley Area

SWMU ID Number: 8.10 SWMU Name: Silver Recovery Process (7934)

Location of Unit: ORNL grid coordinates are N 17,790 and E 32,540. Site is in Melton Valley, just west of the Thorium-Uranium Recycle Facility (TURF) and about 0.75 mile (1.2 km) southeast of ORNL.

General Dimensions and Capacities: Building 7934 is a one-story, corrugated metal, garage-type structure. It is 50 ft (15 m) long by 50 ft wide, with a jointed concrete floor, two garage-type doors, and two walk-in doors. The building contains a pH adjustment tank, two 200-gal (760-L) reaction tanks, and related equipment.

Function of the SWMU: The purpose is to separate silver constituents from photographic fixer and developer waste solutions by a chemical precipitation process.

Dates of Operation: The site is expected to open in April 1987.

Waste Characteristics: No radionuclides are present. Chemicals involved are sodium hydroxide, sodium hydrosulfite, sulfuric acid, and photographic waste solution. The acids and bases are kept 25 ft (8 m) apart, and the silver-bearing waste is stored in 55-gal steel drums.

Release Data: The major air emissions from this site are ammonia, sulfur, and formaldehyde. Samples collected by the Industrial Hygiene Department indicate that emissions in this area are well below the threshold limit value.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 9.0

WAG Name: Homogeneous Reactor Experiment (HRE) Area

SWMU ID Number: 9.1

SWMU Name: HRE Pond (7556)

Location of Unit: The Homogeneous Reactor Experiment (HRE) Pond is located in Melton Valley, 0.5 mile (800 m) southeast of the ORNL complex. It is situated south of Building 7500, above Melton Branch. ORNL grid coordinates are N 18,590 and E 31,480.

General Dimensions and Capacities: Capacity: 300,000 gal (1,136,000 L). Rectangular shape: 76 × 79 ft (23 × 24 m), and average depth is 12.8 ft (3.9 m). In 1970, the pond was filled, graded, and sprayed with weed killer before a top layer of crushed stone and asphalt was applied.

Function of the SWMU: The pond was supposed to receive contaminated condensate from the reactor evaporator. Later, shield water was also added to the pond.

Dates of Operation: Site commissioned: 1955 (began operation in 1958).
Taken out of service: 1961.

Waste Characteristics: Contamination is mainly from Cs-137 and Sr-90, with trace amounts of Pu-238, Pu-239, Am-241, and Cm-244.

Release Data: The maximum direct beta-gamma exposure near the pond was 2.2 mrad/h. Eight areas exceeded 0.1 mrad/h. Soil samples showed activity between 0.06 pCi/g and 6.0 pCi/g. Subsurface soil samples showed Cs-137, Co-60, and Sr-90. Alpha-emitting contaminants were Pu-238, Pu-239, Am-241, and Cm-244. All samples contained Sr-90 activity. Radioactivity inside the perimeter of the filled-in pond was not determined, but it was estimated that from 50 to 100 Ci of radioactivity is present in the pond. A more recent study estimated a total inventory in the impoundment fill and sediment of: Sr-90 (75 Ci), Cs-137 (16 Ci), U-234 (3.2 mCi), U-235 (0.5 mCi), U-238 (2.2 mCi), Pu-239 (0.3 mCi), and Co-60 (1.6 mCi).

Groundwater monitoring data collected through mid 1985 indicate both beta (primarily H-3 and Sr-90) and alpha contamination. Levels of Ba, Cr, and Pb exceeded drinking water MCLs in some sampling records.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 9.0

WAG Name: Homogeneous Reactor Experiment (HRE) Area

SWMU ID Number: 9.2

SWMU Name: LLW Collection and Storage Tanks (7560, 7562)

Location of Unit: Both tanks are found on the HRE site. The 12,000-gal (45,425-L) tank is located just north of the Waste Holding Pond (7556), and the 1,000-gal (3,780-L) tank is located just south of the Waste Evaporator (7502). ORNL grid coordinates are approximately N 18,700 and E 31,450.

General Dimensions and Capacities: Only capacity is available.

Function of the SWMU: The 12,000-gal (45,425-L) tank was designed to hold high-level waste. The 1,000-gal (3,785-L) tank held condensed clean vapor from the evaporator cell; this liquid was stored for sampling. Depending on its radioactivity, the condensate was either sent to the retention pond or to the 12,000-gal tank for recycling.

Dates of Operation: Small tank: 1957–1961 (empty since 1961).
Large tank: 1957–1986 (tank no longer in use).

Waste Characteristics: No analysis of the waste has been reported. Major radionuclides of concern in LLW are considered to be Sr-90, Cs-137, Co-60, and TRU. Various short–half-life radionuclides and some uranium or plutonium isotopes may also be contained in the waste. Initial chemical analysis of LLW indicates that radionuclides are of greater concern than hazardous waste constituents.

Release Data: There is some indication that spillage occurred during transfer of LLW from the large tank. Soil sampling indicates contamination by Sr-90 and Cs-137.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 9.0

WAG Name: Melton Valley Area

SWMU ID Number: 9.3

SWMU Name: Septic Tank—(7501)

Location of Unit: The tank is located east of Building 7500 (NSPP). ORNL grid coordinates are N 18,810 and E 31,510.

General Dimensions and Capacities: Capacity of the tank is 1,400 gal (5,300 L). The tank is concrete.

Function of the Unit: The tank was designed to treat domestic sewage from Building 7501 (NSPP).

Dates of Operation: 1950 to present.

Waste Characteristics: The tank contains domestic sewage; no hazardous or radioactive waste was added to the system.

Release Data: No reported leaks or releases.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 10.0

WAG Name: Hydrofracture Injection Wells and Grout Sheets

SWMU ID Number: 10.1

SWMU Name: Hydrofracture Experimental Site 1 (HF-S1)

Location of Unit: The site used for the first experimental injection was south of Lagoon Road in an area called the Four Acre Site. This location is within the boundary of WAG 7. ORNL grid coordinates for the injection well are N 18,920 and E 25,890.

General Dimensions and Capacities: The injection well was cased with 3.5-in. (9-cm) casing to a depth of 300 ft (91 m). The injection was performed at a depth of 290 ft (88 m). A total of 27,000 gal (102,200 L) of grout was injected.

Function of the SWMU: This site was the first experimental injection of grout as a testing program for observing the fracture pattern created in the shale and to identify potential operating problems.

Dates of Operation: Injection occurred October 16, 1959.

Waste Characteristics: Waste injected was water tagged with 35 Ci of Cs-137 and 8.7 Ci of Ce-141. Grout consisted of diatomaceous earth and cement. No LLW was used. No hazardous waste constitutents should have been present in the grout.

Release Data: During the final stages of the injection, grout was observed flowing from an open core hole about 200 ft (61 m) north of the injection well (see SWMU 7.3).

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 10.0

WAG Name: Hydrofracture Injection Wells and Grout Sheets

SWMU ID Number: 10.2

SWMU Name: Hydrofracture Experimental Site 2 (HF-S2)

Location of Unit: The site is in Melton Valley, about 0.5 mile (800 m) south of the 7500 (experimental reactor) Area. The injection well was cased with 4.5-in. (11-cm) casing to a depth of 1,050 ft (320 m). ORNL grid coordinates for the injection well are N 16,817 and E 31,260.

General Dimensions and Capacities: Two separate injections were performed. Grout volumes injected were 91,600 and 132,700 gal (346,745 and 502,325 L), respectively. Injection depths were 934 ft (284 m) and 695 ft (212 m).

Function of the SWMU: The second hydrofracture experiment was designed to duplicate in scale an actual disposal operation. However, radioactive tracers were used instead of actual waste.

Dates of Operation: The injection occurred September 1960.

Waste Characteristics: Water tagged with Cs-137 (50 Ci for the two injections), cement, and bentonite were used in formulating the grout. No nonradioactive hazardous constituents should be contained in the grout.

Release Data: No releases or spills have been reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 10.0 WAG Name: Hydrofracture Injection Wells and Grout Sheets

SWMU ID Number: 10.3 SWMU Name: Old Hydrofracture Facility (7652)

Location of Unit: The Old Hydrofracture Facility (OHF) is located 1.0 mile (1.8 km) southwest of the main ORNL complex, west of SWSA 5. ORNL grid coordinates are N 17,155 and E 28,617.

General Dimensions and Capacities: The existing facility consists of a contaminated building (7583), some dry solids storage bins, and miscellaneous equipment.

Function of the SWMU: The facility served as a pilot plant to demonstrate the feasibility of permanent disposal of liquid radioactive waste in impermeable shale formations by hydrofracture methods.

Dates of Operation: Site commissioned: 1963.
Taken out of service: 1980.

Waste Characteristics: Waste used in the experiments was evaporator concentrated LLW transferred from the Bethel Valley waste storage tanks. During the period the facility was operated, 7 experimental injections and 22 operational injections were conducted. Grout injected totaled 2.3×10^6 gal (8.7×10^6 L) and contained 40,000 Ci of Sr-90, 609,000 Ci of Cs-137, 233 Ci of Cm-244, 5.8 Ci of TRU, and other unidentified radionuclides.

Release Data: There were no reported surface releases of grout, with the exception of an incident in which it was necessary to divert grout to the OHF waste pit until it could be retrieved and pumped down the well (see SWMU 5.2).

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 10.0

WAG Name: Hydrofracture Injection Wells and Grout Sheets

SWMU ID Number: 10.4

SWMU Name: New Hydrofracture Facility (7860)

Location of Unit: The new hydrofracture facility is located 900 ft (300 m) southwest of OHF (SWMU 10.3), on the south side of Melton Branch. The injection well is located at ORNL grid coordinates N 16,502 and E 28,178.

General Dimensions and Capacities: The injection well casing is 5.5 in. diameter; the well is 1,069 ft (326 m) deep. Injections occurred at depths between 990 ft (300 m) and 1,069 ft. In December 1982 the injection well failed and was placed back in operation in 1983.

Function of the SWMU: The facility was constructed to replace the OHF and serve as the operational LLW waste disposal system for ORNL.

Dates of Operation: Test injection: 1974.
Site commissioned: 1982.
Site removed from service: 1985.

Waste Characteristics: Waste used in the injections was concentrated LLW and sludge removed from the gunite tanks in the South Tank Farm (SWMU 1.26a-f). During the period of operation, 1 experimental injection (water plus tracer) and 13 operational injections were conducted. A total of 2.9×10^6 gal (1.1×10^7 L) of grout was injected. The grout contained 644,000 Ci of Sr-90, 83,800 Ci of Cs-137, 7,500 Ci of Cm-244, 2,100 Ci of TRU, and 13,300 Ci of other nuclides.

Release Data: No releases were reported during operations. In 1984, three deep monitoring (DM) wells were dug, and contaminated water was found in two of the wells. Depths at which the contamination was observed are approximately the depths at which some of the NHF grout sheets occur. The NHF is now inactive, and closure of the facility is being planned.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 11.0

WAG Name: White Wing Scrap Yard

SWMU ID Number: 11.1

SWMU Name: White Wing Scrap Yard (XD0751)

Location of Unit: This site is located at the west end of East Fork Ridge between State Highway 95 (White Wing Road) and the Oak Ridge Turnpike. ORGDP grid coordinates are N 35,000–35,800 and E 27,500–29,259.

General Dimensions and Capacities: The area covers about 20 acres (8 ha).

Function of the SWMU: The site was used to store contaminated materials (equipment, tanks, and trucks) from the three Oak Ridge plants. Waste was stored aboveground. Much of the stored materials and contaminated soils was removed in 1966–1971; however, some scrap metal, concrete, and other waste remains at the site.

Dates of Operation: Site commissioned: early 1950s.
Taken out of service: 1964.

Waste Characteristics: About 0.05 lb (25 g) of Pu-239 was estimated to be on or in the material from ORNL that was stored at the site. No records are available on wastes from the other Oak Ridge plants.

Release Data: In 1971, a radiation survey detected 0.8 to 6.0 mR/h gamma exposure rate and 0.5 to 4.0 mR/h exposure rate for Cs-137. An aerial survey in 1974 indicated the presence of Cs-137 (estimated at 25 to 100 mCi), Th-234, and U-235.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 12.0

WAG Name: Closed Contractors' Landfill

SWMU ID Number: 12.1

SWMU Name: Closed Contractors' Landfill (7658)

Location of Unit: The site is located in Melton Valley south of the 7000 Area and east of Melton Valley Access Road. ORNL grid coordinates are N 18,650 and E 37,500.

General Dimensions and Capacities: The area of the site is 3 acres (1.2 ha). No records are available on the amount of debris buried.

Function of the SWMU: The site was used to bury general construction debris generated by construction contractors working at ORNL. Material to be buried was not contaminated with radioactive materials.

Dates of Operation: Site commissioned: 1950.
Taken out of service: 1975.

Waste Characteristics: The volume and nature of waste buried is unknown. No waste specific records were kept on the landfill operation.

Release Data: The area is inactive, and no radioactive contamination has been reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 13.0

WAG Name: Environmental Research Areas

SWMU ID Number: 13.1

SWMU Name: Cesium-137 Contaminated Field (0800)

Location of Unit: These areas are located about 330 ft (100 m) north of the Clinch River at Clinch River Mile 20.5 (CRK 32.8). Grid coordinates are N 17,480 and E 20,370.

General Dimensions and Capacities: The 0800 Area is a 50-acre (20-ha) fescue-dominated field. Contained within the field is a 5-acre (2-ha) fenced area contaminated with Cs-137.

Function of the SWMU: The area was set aside to study simulated fallout of Cs-137, which would occur in the event of a nuclear war.

Dates of Operation: Site commissioned: 1966.
The site is not in use.

Waste Characteristics: The contaminant consisted of Cs-137 fused at high temperature to silica particles. Each of the eight enclosures received about 2.2 Ci of radioactivity, for a total of 8.8 Ci. After 18 years (since contamination), about 5.7 Ci of activity should remain.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 13.0

WAG Name: Environmental Research Areas

SWMU ID Number: 13.2

SWMU Name: Cesium-137 Erosion/Runoff Study Area (0807)

Location of Unit: The site is located on a bearing of E83°S, about 1.2 miles (2.0 km) from the junction of Bethel Valley Road and State Highway 95. The site is due north of the confluence of White Oak Creek and the Clinch River [0.2 mile (0.3 km)]. Grid coordinates N 16,690 and E 21,530.

General Dimensions and Capacities: Total land area contaminated was <215 sq ft (<20 sq m).

Function of the SWMU: The objective was to use the field contamination to study runoff, erosion, and infiltration of Cs-137 on a silt-loam soil.

Dates of Operation: Site was contaminated on October 20, 1964.
Site is still being studied.

Waste Characteristics: Cs-137 was applied to the soil in a liquid spray.

Release Data: The amount of isotope applied was 15 mCi total. After 21.6 years of decay, 9.15 mCi should remain, providing no losses from the system occurred.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 14.0

WAG Name: Tower Shielding Facility (TSF)

SWMU ID Number: 14.1

SWMU Name: TSF Scrap Yard (7702)

Location of Unit: Grid coordinates are N 10,800 and E 28,930. The facility is located about 2.5 miles (4.0 km) south of the ORNL main complex.

General Dimensions and Capacities: The scrap yard is about 250 ft (76 m) south and west of the main TSF site. It covers an area of about 1 acre (0.4 ha).

Function of the SWMU: The site contains scrap shields, tanks, pumps, and miscellaneous materials used in past experimental programs.

Dates of Operation: Site commissioned: 1954.
Site is still in operation.

Waste Characteristics: The scrap at the site contains internal contamination (neutron activation products) (mainly Co-60); however, surveys show no external contamination.

Release Data: No releases of radioactivity have been reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 14.0

WAG Name: Tower Shielding Facility (TSF)

SWMU ID Number: 14.2

SWMU Name: Septic Tank—(Building 7750)

Location of Unit: The TSF septic tank is located at ORNL grid coordinates N 11,110 and E 29,295.

General Dimensions and Capacities: Capacity of the tank is 900 gal (3,400 L). The tank is concrete.

Function of the SWMU: The tank treats domestic sewage from the operating facilities.

Dates of Operation: 1953 to present.

Waste Characteristics: The tank contains domestic sewage; no hazardous or radioactive wastes were added to the system.

Release Data: No reported leaks or releases.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 15.0

WAG Name: ORNL Facilities at Y-12

SWMU ID Number: 15.1

SWMU Name: Cyclotron Z-Oil (9201-2)

Location of Unit: The Cyclotron Z-oil is stored at the Y-12 Plant in Building 9201-2 and in an outdoor storage tank and piping.

General Dimensions and Capacities: The 86-Inch Cyclotron occupies one-third of Building 9201-2. See 15a.7

Function of the SWMU: The Code AE transformer oil is designed to cool magnetic coils during operation.

Dates of Operation: Site commissioned: 1950.
Taken out of service: 1983.

Waste Characteristics: There is 7,000 gal (26,500 L) of Code AE transformer oil. The oil contains <50 ppm PCBs (polychlorinated biphenyls).

Release Data: No releases have occurred.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 15.0

WAG Name: ORNL Facilities at Y-12

SWMU ID Number: 15.2

SWMU Name: Transformers (9201-2, 9204-1, 9204-3, SY 200 Yard)

Location of Unit: The PCB storage sites are located over Maynardville limestone, a cavernous formation within the Y-12 complex, in or adjacent to buildings 9201-2, 9204-1, and 9204-3. Larger transformers were stored at the SY 200 Scrap Yard.

General Dimensions and Capacities: At the 9201-2 Cyclotron cubicles, there were 143 PCB transformers and 360 capacitors with an estimated PCB concentration of more than 500 ppm (~3,000 gal [11,355 L] of oil). East of 9204-1 there were 13 PCB-contaminated transformers with estimated PCB concentrations of 50 to 500 ppm. In the basement of 9204-3 there were 22 PCB-contaminated transformers with estimated PCB concentrations of 50 to 500 ppm. At the SY 200 Yard there were five 2,200-gal (8,328-L) transformers and 60 cooling racks with estimated PCB concentrations of less than 2 to 29 ppm.

Function of the SWMU: The sites housed a variety of surplus ORNL equipment that was either contaminated with PCBs or that contained PCB contaminated oils. All surplus PCB-contaminated transformers and capacitors have been disposed of in accordance with TSCA guidelines.

Dates of Operation: Sites are now inactive.

Waste Characteristics: (See above.)

Release Data: Records indicate that PCB-contaminated oils have leaked from a transformer at the SY 200 Yard.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 16.0

WAG Name: Health Physics Research Reactor (HPRR) Area

SWMU ID Number: 16.1

SWMU Name: Cesium-137 "Forest" Research Area (77659)

Location of Unit: The site containing the contaminated trees is located on the azimuth bearing of E66°S, a distance of 1.8 mile (2.9 km) from the intersection of Bethel Valley Road and Melton Valley Access Road. ORNL grid coordinates are N 13,000 and E 34,500.

General Dimensions and Capacities: The site is a 20 × 25 m plot (66 × 82 ft). Thirty yellow-poplar trees ranging up to ~100 ft (30 m) tall were used in this study. A total of 467 mCi of Cs-137 was introduced into the transpiration stream of the trees.

Function of the Unit: Trees were inoculated with cesium to determine the movement of this nuclide and as an analog to the essential element potassium.

Dates of Operation: Site commissioned: May 20–23, 1962.
Site still remains today.

Waste Characteristics: Cs-137 is the primary waste. Nearly 24 years have passed (~0.8 half-life) since the isotope was injected into the trees. Correcting only for radiological decay, approximately 270 mCi would remain today. This amount has been further decreased by wind distribution of leaves, movement through soil, and runoff.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 16.0

WAG Name: Health Physics Research Reactor Area

SWMU ID Number: 16.2

SWMU Name: Process Waste Basin (7711)

Location of Unit: ORNL grid coordinates are N 12,260 and E 35,830. Site is located west of the reactor building at the DOSAR facility (HPRR).

General Dimensions and Capacities: No information available.

Function of the SWMU: The retention basin was installed to collect groundwater seepage into the reactor storage vaults.

Dates of Operation: The facility was never used for its intended purpose.

Waste Characteristics: No waste has been added. The only water in the basin results from precipitation and checks on fire protection sprinkler systems.

Release Data: No waste has ever been diverted to the basin. The major use of the basin is to check out fire protection systems.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 17.0

WAG Name: ORNL Services Area

SWMU ID Number: 17.1

SWMU Name: Septic Tank—(Building 7000)

Location of Unit: The tank is located south of Building 7000. ORNL grid coordinates are N 21,950 and E 36,230.

General Dimensions and Capacities: Capacity of the tank is 39,000 gal (147,630 L). The tank is concrete.

Function of the SWMU: The unit handles domestic sewage from the 7000 Area. It was formerly used as a septic tank but is now used as a collection vessel for the pumping station. Waste is pumped to the Bethel Valley system for treatment.

Dates of Operation: 1959 to present.

Waste Characteristics: Waste consists of domestic sewage; no hazardous or radioactive wastes have been added to the system.

Release Data: No reported leaks or releases.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 17.0

WAG Name: ORNL Services Area

SWMU ID Number: 17.2a

SWMU Name: Waste Oil Storage Tank—(7002W)

Location of Unit: The tank is located on the west side of Building 7002. ORNL grid coordinates are N 21,840 and E 36,800.

General Dimensions and Capacities: The tank is 5 ft 4 in. (1.7 m) diameter by 15 ft (4.6 m) long, horizontal, steel, and located above ground. Tank capacity is 2,500 gal (9,463 L).

Function of the SWMU: The tank is used to store waste oil.

Dates of Operation: The tank was installed in 1984.
It is still in service.

Waste Characteristics: The tank contains waste oil. No records exist of hazardous materials or radionuclides being present. The oil has not been analyzed.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 17.0

WAG Name: ORNL Services Area

SWMU ID Number: 17.2b

SWMU Name: Waste Oil Storage Tank—(7009E)

Location of Unit: This tank is located in the 7000 Area, east of the main plant area of ORNL. ORNL grid coordinates are N 21,580 and E 37,560.

General Dimensions and Capacities: The tank is buried. Capacity of the tank is 5,000 gal (18,930 L).

Function of the SWMU: The tank is used to store waste oil drained from various pieces of equipment.

Dates of Operation: Installation date: 1975.
Site is still in use.

Waste Characteristics: The waste oil has not been analyzed. No hazardous materials or radionuclides should be present.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 17.0

WAG Name: ORNL Services Area

SWMU ID Number: 17.2c

SWMU Name: Waste Oil Storage Tank—(7075)

Location of Unit: This tank is located in the 7000 Area, which is east of the main ORNL plant. ORNL grid coordinates are N 21,100 and E 36,680.

General Dimensions and Capacities: The tank is below ground. Capacity is 4,200 gal (15,900 L).

Function of the SWMU: The tank stores tritium-contaminated waste oil.

Dates of Operation: Installation date: 1982.
Site is still in use. The tank is reported to be full.

Waste Characteristics: This tank is contaminated with very low levels of radioactive waste oils. No data are available relative to the presence of hazardous constituents in the waste oil.

Release Data: No releases have been reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 17.0

WAG Name: ORNL Services Area

SWMU ID Number: 17.2d

SWMU Name: Waste Oil Storage Tank—(7021W)

Location of Unit: The tank is located on the west side of Building 7021. ORNL grid coordinates are N 21,800 and E 37,300.

General Dimensions and Capacities: The tank is 4 ft (1.2 m) diameter, 8 ft (2.4 m) long, horizontal, steel, and located above ground. Tank capacity is 480 gal (1,817 L).

Function of the SWMU: The tank stores waste oil.

Dates of Operation: The tank was installed in 1983.
It is still in service.

Waste Characteristics: The tank contains waste oil. No records exist of hazardous materials or radionuclides being present. The oil has not been analyzed.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 17.0

WAG Name: ORNL Services Area

SWMU ID Number: 17.3

SWMU Name: Waste Oil Storage Tank Mobile Truck (7030E)

Location of Unit: This vehicle-mounted oil storage tank is located in the 7000 Area east of the main ORNL plant. It is located at ORNL grid coordinates N 21,540 and E 37,140.

General Dimensions and Capacities: Capacity of the tank is approximately 1,100 gal (4,164 L). The tank is mounted on a vehicle.

Function of the SWMU: The tank is used to collect and store waste fuel oil.

Dates of Operation: 1975 to present

Waste Characteristics: The tank contains waste fuel oil only. It is reported to contain PCBs. No mention of radionuclides is reported.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 17.0

WAG Name: ORNL Services Area

SWMU ID Number: 17.4a

SWMU Name: Photographic Reproduction Waste Storage Tank—(7075A)

Location of Unit: The tank is located in the 7000 Area east of the main ORNL plant. ORNL grid coordinates are N 21,100 and E 36,700. There are two tanks at this site (See SWMU 17.4b).

General Dimensions and Capacities: This tank is constructed of fiberglass and has a capacity of 3,000 gal (11,356 L). The tank is located on a concrete pad. Concrete dikes surround the pad.

Function of the SWMU: The tank stores photographic activators and developer waste. Periodically, waste is transferred to the silver-recovery unit in Melton Valley (SWMU 8.10).

Dates of Operation: Installation date: unknown.
Tank is still in service.

Waste Characteristics: Chemical composition is not known. The waste is probably hazardous due to silver content.

Release Data: No leaks or spills have been reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 17.0

WAG Name: ORNL Services Area

SWMU ID Number: 17.4b

SWMU Name: Photographic Reproduction Waste Storage Tank—(7075B)

Location of Unit: The tank is located in the 7000 Area east of the main ORNL plant. ORNL grid coordinates are N 21,100 and E 36,700. There are two tanks at this site (See SWMU 17.4a).

General Dimensions and Capacities: The tank is constructed of fiberglass and has a capacity of 2,000 gal (7,570 L). The tank is located on a concrete pad. Concrete dikes surround the pad.

Function of the SWMU: The tank stores photographic activators and developer waste. Periodically, waste is transferred to the silver-recovery unit in Melton Valley (SWMU 8.10).

Dates of Operation: Installation date: unknown.
Tank is still in service.

Waste Characteristics: Chemical composition is not known. The waste is probably hazardous due to silver content.

Release Data: No leaks or spills have been reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 18.0

WAG Name: Consolidated Fuel Reprocessing Area

SWMU ID Number: 18.1a

SWMU Name: EGCR Ponds (7600A)

Location of Unit: ORNL grid coordinates are N 18,640 and E 43,580.

General Dimensions and Capacities: This pond is 50 ft (15 m) by 65 ft (20 m), with a depth of 15 ft (4.6 m).

Function of the SWMU: This area was originally installed as part of the Experimental Gas Cooled Reactor Program. The reactor was never completed or operated. The basin is now used to collect storm water runoff.

Dates of Operation: Basin constructed: 1960.
Site is still in use.

Waste Characteristics: No data are available on waste composition.

Release Data: No leaks or releases have been reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 18.0

WAG Name: Consolidated Fuel Reprocessing Area

SWMU ID Number: 18.1b

SWMU Name: EGCR Ponds (7600B)

Location of Unit: ORNL grid coordinates are N 18,020 and E 42,660.

General Dimensions and Capacities: The basin is 50 ft (15 m) by 65 ft (20 m), with a depth of 15 ft (4.6 m).

Function of the SWMU: This area was originally installed as part of the Experimental Gas Cooled Reactor Program. The reactor was never completed or operated. The basin is now used to collect storm water runoff.

Dates of Operation: Basin constructed: 1960.
Site is still in use.

Waste Characteristics: No data are available on waste composition.

Release Data: No leaks or releases have been reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 18.0

WAG Name: Consolidated Fuel Reprocessing Area

SWMU ID Number: 18.2

SWMU Name: Paint Solvents Storage (7615)

Location of Unit: This site is located at the north end of the 7615 storage building. ORNL grid coordinates are N 18,320 and E 43,600.

General Dimensions and Capacities: This unit is an underground steel tank. Dimensions are 2.5 ft diameter (7.6 m) and 7 ft (2 m) high. Capacity is 280 gal (1,060 L).

Function of the SWMU: The contents of this tank (and its function) are unknown. Reports indicate that the tank may have stored paint solvents.

Dates of Operation: Installation date: 1962.
The tank is inactive.

Waste Characteristics: No information exists on the nature and amount of waste stored in this tank.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 18.0 WAG Name: Consolidated Fuel Reprocessing Area

SWMU ID Number: 18.3 SWMU Name: Septic Tank—(Building 7616)

Location of Unit: This tank is located at ORNL grid coordinates N 18,000 and E 42,600

General Dimensions and Capacities: Capacity is 16,900 gal (64,000 L). The tank is made of concrete.

Function of the SWMU: The tank was originally installed in 1959 as an Imhoff tank for handling sewage from the EGCR. It was converted to a septic tank in 1974 for use by the Consolidated Fuel Reprocessing Division of ORNL.

Dates of Operation: As Imhoff tank: 1959–1974.
As septic tank: 1974–present.

Waste Characteristics: The tank contains domestic sewage; no hazardous or radioactive wastes have been added to the system.

Release Data: There are no reported leaks or releases.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 18.0

WAG Name: Consolidated Fuel Reprocessing Area

SWMU ID Number: 18.4a

SWMU Name: Waste Acid Storage Tank (7602)

Location of Unit: This tank is located in the EGCR area east of the main ORNL plant area. ORNL grid coordinates are N 18,640 and E 43,580.

General Dimensions and Capacities: Tank capacity is 13,000 gal (49,210 L). The storage tank is located below ground.

Function of the SWMU: The tank is used for slightly acidic process waste storage from the EGCR area.

Dates of Operation: Installation date: unknown.
Tank is still in service.

Waste Characteristics: The waste in the tank is process waste.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 18.0

WAG Name: Consolidated Fuel Reprocessing Area

SWMU ID Number: 18.4b

SWMU Name: Waste Acid Storage Tanks (7602b and c)

Location of Unit: The two tank trucks are located in the EGCR area east of the main ORNL plant area. ORNL grid coordinates are N 18,560 and E 43,140.

General Dimensions and Capacities: The capacity of each tank is 1,000 gal (3,785 L).

Function of the SWMU: The tanks contain waste acid. The tanks are used to haul process waste from the EGCR area to the PWTP at the main plant area.

Dates of Operation: Installation date: unknown.
The tanks are still in service.

Waste Characteristics: The waste in the tanks is process waste.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 18.0

WAG Name: Consolidated Fuel Reprocessing Area

SWMU ID Number: 18.4c

SWMU Name: Waste Acid Storage Tanks (7602b and c)

Location of Unit: The two tank trucks are located in the EGCR area east of the main ORNL plant area. ORNL grid coordinates are N 18,560 and E 43,140.

General Dimensions and Capacities: The capacity of each tank is 1,000 gal (3,785 L).

Function of the SWMU: The tanks contain waste acid. The tanks are used to haul process waste from the EGCR area to the PWTP at the main plant area.

Dates of Operation: Installation date: unknown.
The tanks are still in service.

Waste Characteristics: The waste in the tanks is process waste.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 18.0

WAG Name: Consolidated Fuel Reprocessing Area

SWMU ID Number: 18.4d

SWMU Name: Waste Acid Storage Tank—(7601)

Location of Unit: The tank is located in the EGCR area east of the main ORNL plant area. ORNL grid coordinates are N 18,560 and E 43,100.

General Dimensions and Capacities: The tank has a capacity of 2,500 gal (9,464 L). It is located above ground.

Function of the SWMU: The tank was installed to store process waste but was never used.

Dates of Operation: Installed: unknown.

*Waste Characteristics:*The tank contains process waste.

Release Data: No releases reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 18.0

WAG Name: Consolidated Fuel Reprocessing Area

SWMU ID Number: 18.5

SWMU Name: Waste Retention Basin (7613)

Location of Unit: ORNL grid coordinates are N 18,600 and E 43,050.

General Dimensions and Capacities: The basin measures about 30 ft (9 m) by 40 ft (12 m). A concrete divider divides the basin.

Function of the SWMU: No function is known (the basin may have been installed as a waste retention basin for EGCR but was never used for its intended purpose). It is currently used as an emergency water supply for fire protection.

Dates of Operation: Installed: 1960.
Basin is still in service.

Waste Characteristics: All EGCR process wastes are disposed of by tank truck transfer to the ORNL main plant area.

Release Data: No releases are reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 19.0

WAG Name: Hazardous Waste Treatment and Storage Facilities

SWMU ID Number: 19.1

SWMU Name: Hazardous Waste Storage Facility (7652)

Location of Unit: ORNL grid coordinates are N 15,750 and E 36,880.

General Dimensions and Capacities: The Storage Facility measures 61.7 by 39 ft (18.3 by 12 m). It is divided into separate areas designed to hold specific wastes. A total of 15,125 gal (57,254 L) of waste can be stored at the facility.

Function of the SWMU: The site will store hazardous wastes that have already been packaged, labeled, and marked according to Department of Transportation regulations.

Dates of Operation: Construction at the site has been completed (1987).

Waste Characteristics: Wastes to be stored are acids, bases, organic acids, poisons, and flammable wastes.

Release Data: The site has not received wastes.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 19.0

WAG Name: Hazardous Waste Treatment and Storage Facilities

SWMU ID Number: 19.2

SWMU Name: Chemical Waste Storage and Cylinder Area (7653)

Location of Unit: ORNL grid coordinates are N 15,770 and E 36,950.

General Dimensions and Capacities: The facility consists of a prefabricated steel building having a floor area of 3,060 sq ft (284 sq m). The capacity of the facility will be sixty 55-gal drums.

Function of the Unit: The site is a staging area for appropriately packaging small quanitites of laboratory chemicals and some process chemical wastes into drums for storage. Wastes will be separated by RCRA classes, and when drums are filled they will be transferred to the adjacent Hazardous Waste Storage Facility (Building 7652) to await shipment off-site.

Dates of Operation: The site is not currently in operation. Construction is almost complete.

Waste Characteristics: The wastes are laboratory chemical wastes and some process wastes that contain hazardous constituents. Mixed wastes (hazardous and radioactive) are not handled.

Release Data: No releases are reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 19.0

WAG Name: Hazardous Waste Treatment and Storage Facilities

SWMU ID Number: 19.3

SWMU Name: Long-Term Hazardous Waste Storage Facility (7654)

Location of Unit: ORNL grid coordinates are N 15,810 and E 36,890.

General Dimensions and Capacities: This proposed facility will have a total of 1,178 sq ft (165 sq m) of storage space.

Function of the Unit: The site stores 55- and 30-gal drums of mixed (hazardous and radioactive) wastes.

Dates of Operation: The site is not operational at this time.
Construction is completed, but no waste has been stored.

Waste Characteristics: Wastes will normally be placed in containers (55-gal drums) when received. Most of the wastes received will be discarded laboratory chemicals. Wastes will include bulk scintillation fluid and scintillation vials.

Release Data: The facility is not operational.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 19.0

WAG Name: Hazardous Waste Treatment and Storage Facilities

SWMU ID Number: 19.4

SWMU Name: Mixed Waste Storage Facility (7651)

Location of Unit: This unit is located southeast of the main ORNL plant area in Melton Valley. ORNL grid coordinates are N 15,720 and E 37,000.

General Dimensions and Capacities: The facility is a covered, diked concrete pad. Approximate dimensions are 20 ft (6 m) by 30 ft (9 m).

Function of the SWMU: The site was used to store mixed hazardous wastes. Originally, it served as sample storage for ORNL's Chemical Technology Division.

Dates of Operation: The site was closed near the end of 1985 because of construction work nearby.

Waste Characteristics: Waste type is defined only as mixed hazardous waste. *Mixed* is used to indicate that wastes can contain radioactive materials and chemically hazardous wastes.

Release Data: No hazardous wastes have been released from this facility

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 19.0

WAG Name: Hazardous Waste Treatment and Storage Facilities

SWMU ID Number: 19.5

SWMU Name: Leaking Gas Cylinder Area (7659A)

Location of Unit: The facility is located southeast of ORNL in a remote section of Melton Valley. ORNL grid coordinates are N 17,850 and E 39,750.

General Dimensions and Capacities: The area is fenced and measures about 75 by 150 ft (23 by 46 m).

Function of the SWMU: Each year a number of gas cylinders have problems with shut-off valves, resulting in leaks. Cylinders are transported to this area where they are chained to the fence and left to vent. Once empty, the gas cylinders are handled as deemed appropriate.

Dates of Operation: Facility constructed: about 1983.
Site is still in operation.

Waste Characteristics: Wastes consist of various nonradioactive gases routinely used in ORNL operations.

Release Data: No liquid wastes are involved. Gases are dissipated into the atmosphere. No releases of hazardous materials are reported.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 19.0

WAG Name: Hazardous Waste Treatment and Storage Facilities

SWMU ID Number: 19.6

SWMU Name: Reactive Chemicals Disposal Area (7653)

Location of Unit: ORNL grid coordinates are N 17,950 and E 39,830. The site is located to the southeast of the ORNL main plant area in a remote area.

General Dimensions and Capacities: The Reactive Bottle Smasher is a box 18 in. (46 cm) deep, 30 in. (76 cm) wide, and 48 in. (122 cm) long. It is located in a fenced area measuring 75 by 150 ft (23 by 46 m).

Function of the Unit: This facility, also known as the Reactive Chemicals Bottle Smasher, is used to crush glass and metal containers and release their contents to the atmosphere. It is a 0.5-in. plate steel box with a hinged lid. Containers to be smashed are placed in the box, and the lid is released remotely from approximately 75 ft (23 m) away. The lid swings into the box, smashing the glass and metal containers.

Dates of Operation: Site installed: 1983. Site is still in service.

Waste Characteristics: Contents of containers are highly volatile liquids (e.g., hydrazine, ethers, alcohol-ether mixtures, etc.).

Release Data: No releases have been reported. Crushed glass and metal containers are disposed of in the Contractors' Landfill. No monitoring of the site is conducted.

EPA II.A.1 DATA SUMMARY SHEET

WAG ID Number: 20.0

WAG Name: Oak Ridge Land Farm

SWMU ID Number: 20.1

SWMU Name: Municipal Sewage Sludge Application Site (XF1226)

Location of Unit: The site is located north of Bethel Valley Road about 5 miles east of the main ORNL plant area.

General Dimensions and Capacities: Approximately 65 acres (26 ha) has been used to date.

Function of the Unit: The unit functions as a land disposal operation for digested sewage sludge from the city of Oak Ridge's sewage treatement plant.

Dates of Operation: Sludge disposal began in 1983.
Sludge disposal was moved to another site in 1986.

Waste Characteristics: The waste is digested sewage sludge. Due to water discharged into the Oak Ridge sewer system by certain industries, radionuclides have been detected in the sewage sludge. Inventory of radionuclides at this site is 0.074 Ci from Co-60, 0.013 Ci from Sr-90, 0.044 Ci from Cs-137, 0.010 Ci from Pu-239, 180.0 kg (397 lb) of Cd, 110.0 kg (242.5 lb) of Ni, and 4,600.0 kg (10,141 lb) of Pb. Volume of sludge applied was about 6.0×10^6 gal (2.3×10^7 L).

Release Data: Limited sampling of soil and surface water on the site does not indicate that there are potential public health problems due to exposure to the radionuclides. Groundwater sampling at the site has been initiated.

DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

ID Number: 1A.1

Facility Name: Graphite Reactor—(3001)

Location of Unit: The Graphite Reactor is located in Building 3001 at the ORNL complex in Bethel Valley. Building 3001 is just north of Hillside Avenue between Third and Fifth streets. ORNL grid coordinates are N 22,570 and E 31,190.

General Dimensions and Capacities: Building 3001 is a five-story corrugated metal structure. The reactor was originally designed for a 1-MW power level, but in 1944 improvements in the cooling system and fuel cladding allowed the power level to be increased to an average rate of 3.6 MW.

Function: The Graphite Reactor was built to produce the first gram-size quantitites of plutonium to provide information for the construction of the large plutonium production reactors located at Hanford, Washington. It was later converted to a training reactor. In 1966, the fuel was removed from the reactor.

Dates of Operation: Date commissioned: 1943.
Taken out of service: 1963.

Waste Characteristics: The reactor is reported to contain 16 Ci of C-14, 5,000 μCi (80 mg) of Pu-239, 200 μCi (<0.5 kg) of uranium oxide, and lesser radiation sources. Gamma spectroscopy indicates the presence of Cs-137 and Co-60. An order-of-magnitude of less than 10 Ci of each is estimated. Thus, the radionuclide inventory in the reactor probably totals less than 50 Ci. The demineralization room, or hot cell, was checked, and Cs-137 and Co-60 were detected in the gamma spectrum. Five percent of the alpha readings (only one reading) were above the ORNL guidelines for establishing a contamination zone. The beta-gamma contamination levels ranged from less than 500 dpm/100 sq cm to 1,670 dpm/100 sq cm, with an average of approximately 500 dpm/100 sq cm. The only alpha contamination measured 32 dpm/100 sq cm.

Release Data: No releases reported.

DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

ID Number: 1A.2

Facility Name: Low Intensity Test Reactor (LITR)—(3005)

Location of Unit: The LITR is located in the northern portion of the main ORNL complex in Building 3005. ORNL grid coordinates are N 22,730 and E 31,400.

General Dimensions and Capacities: The LITR began operation as a 500-kW reactor but was converted and reached a final power level of 3,000 kW.

Function: The LITR began operation as a training reactor and was later converted to a test reactor. After shutdown in 1968, all fuel and shim safety rods were removed from the reactor tank, water was drained, and connections were made to exhaust continuously to the normal off-gas system.

Dates of Operation: Date commissioned: March 1951.
Taken out of service: October 1968.

Waste Characteristics: Interior surfaces of the reactor tank and primary water piping system are contaminated with radioactive corrosion products and fission products. It has been estimated that the reactor core contains between 6 and 45 Ci of Co-60, less than 50 Ci of Ni-63, and less than 10 Ci of Fe-55, which are all activation products. It was also estimated that the core might give a reading of about 200–300 rad/h. The core still contains beryllium reflector elements. Only very slight amounts of contamination are indicated on the interiors of the LITR heat exchanger and on pipes in the upper levels of Building 3005.

Release Data: No releases reported.

DATA SUMMARY SHEET

WAG ID Number: 1.0 WAG Name: Main Plant Area

ID Number: 1A.3 Facility Name: Oak Ridge Research Reactor—(3042)

Location of Unit: The Oak Ridge Research Reactor (ORR) is located just north of Hillside Avenue between Third and Fifth streets. ORNL grid coordinates are N 22,570 and E 31,400. All of the experimental facilities are housed in the reactor building except for some equipment associated with the Maritime Ship Reactor Loop that is buried underground outside Building 3042 and a portion of the pneumatic tube facility that runs between Building 3042 and Building 3001.

General Dimensions and Capacities: The ORR is a 30-kW pool-type research reactor housing several experimental facilities.

Function: Several experimental facilities have been installed in the ORR for testing of various materials, analysis of liquid and gaseous coolant systems, and transfer of irradiated samples.

Dates of Operation: Site commissioned: 1959.
Site is still in operation.

Waste Characteristics: The ORR produces activation products in the primary coolant water. It does not produce waste during normal operations.

Release Data: The only reported releases were due to a break in the primary water line (see SWMU 1.5l) and some leakage caused by the rupture of the decay tank (see SWMU 1.9).

DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

ID Number: 1A.4

Facility Name: Cobalt-60 Storage Garden—(3029)

Location of Unit: The Cobalt-60 Storage Garden is located in Building 3029 between Central and Hillside avenues and between Fourth Street and Fifth Street. ORNL coordinates are N 22,290 and E 31,530.

General Dimensions and Capacities: This 19.6-sq-ft (1.8-sq-m) subterranean area [8.5 ft (2.6 m) deep] is made of 92 stationary stainless steel tubes surrounding a 1-sq-ft (0.09-sq-m) by 6.8-ft-long (2.1-m) irradiator plug. Each tube is plugged at the top with a lead-filled stainless steel tube. The Co-60 storage cans located at the bottom of the tubes, which terminate about 1 ft above the floor of the facility, surround an irradiation chamber. This chamber is shielded at the bottom with 10.6 cubic ft (0.03 cubic m) of lead. The entire facility is shielded with 22 in. (56 cm) of lead bricks plus 22 in. of barytes concrete. This facility is capable of gamma irradiation doses of up to 1.5×10^6 rad/h.

Function: The Storage Garden is a radioisotope storage facility.

Dates of Operation: Site commissioned: late 1950s.
Site is still operable but not in use.

Waste Characteristics: The Garden currently has an inventory of about 50,000 Ci of metallic form Co-60. The Garden does not produce waste.

Release Data: No reported releases.

DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

ID Number: 1A.5

Facility Name: Fission Product Development Laboratory (FPDL)—(3517)

Location of Unit: The FPDL is located in Building 3517 at ORNL. ORNL coordinates are N 21,730 and E 31,000.

General Dimensions and Capacities: The FPDL consists of 23 large-volume, stainless steel lined, concrete-shielded hot cells with associated manipulator galleries and operating areas.

Function: The FPDL was constructed to separate kilocurie quantities of Cs-137, Sr-90, Ce-144, and Pm-147. It was modified in 1963 to allow production of megacurie amounts of Cs-137, Sr-90, and Ce-144.

Dates of Operation: Site commissioned: 1958.
Site placed in standby condition: 1975.

Waste Characteristics: Primary wastes are Sr-90 and Cs-137.

Release Data: The inactive process cells contain an array of contaminated tanks, piping, samplers, services, and instrumentation with background radiation levels ranging 1–100 rad/h, with isolated hot spots of 100–1,000 rad/h. During decontamination, which is still continuing, an estimated 8,013 cubic ft (227 cubic m) of solid LLW waste and 9,354 cubic ft (265 cubic m) of liquid waste will be generated. Approximately half of this waste has already been disposed of.

DATA SUMMARY SHEET

WAG ID Number: 1.0 WAG Name: Main Plant Area

ID Number: 1A.6 Facility Name: Fission Product Pilot Plant—(3515)

Location of Unit: The Fission Product Pilot Plant (FPPP) is located at ORNL on the east side of the South Tank Farm in Building 3515. ORNL coordinates are N 21,960 and E 31,030.

General Dimensions and Capacities: Formally known as the Ru-106 tank arrangement, the facility consisted of a concrete pad with tanks surrounded by stacks of concrete blocks. The present facility consists primarily of an unlined concrete-shielded cell, approximately 19.7 × 9.9 × 7.9 ft (6.0 × 3.0 × 2.4 m high), with an adjacent shielded operating area.

Function: From 1950–1951, the facility functioned as a hot cell facility. It was then used to separate curie quantities of various radionuclides from low-level liquid wastes.

Dates of Operation: Site commissioned: 1948.
Taken out of service: 1958.

Waste Characteristics: Specific waste information is not available.

Release Data: The current residual radionuclide inventory is believed to be in the range of 10 to 100 Ci, although no recent survey information is available due to lack of direct access. About 3,313 cubic ft (92.7 cubic m) of solid radioactive waste and 7,063 cubic ft (200 cubic m) of liquid radioactive waste will be generated during decommissioning of this facility.

DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

ID Number: 1A.7

Facility Name: Metal Recovery Facility—(3505)

Location of Unit: The Metal Recovery Facility is located at ORNL in Building 3505. ORNL grid coordinates are N 21,840 and E 31,910.

General Dimensions and Capacities: The Metal Recovery Facility consists of Building 3505, an adjacent below-grade canal, and two waste tanks (W-18, W-19) buried nearby. The building is a one-story steel siding structure constructed around seven above-grade concrete process cells and a below-grade dissolver tank pit. The canal is a 14-ft-deep (4.3-m-deep) water-filled concrete basin that was used for storing and handling fuel slugs. The two waste tanks [32,190 gal (8,516 L) capacities] are located below grade approximately 45 ft (15 m) east of the building.

Function: The Metal Recovery Facility was a small-scale reprocessing plant originally constructed for the recovery of uranium from fuel and waste solutions. The facility was later found to be useful for recovering U, Pu, Am, and other miscellaneous materials from a variety of low-burnup reactor fuels and other feed materials.

Dates of Operation: Site constructed: 1951.
Site commissioned: 1952.
Taken out of service: 1960.

Waste Characteristics: Primary wastes are Sr-90, Cs-137, Pu-238, Pu-239, and Pu-240.

Release Data: Abandoned contaminated process equipment (located in the process cells, the dissolver pit, and the canal) exhibits significant levels of alpha and beta-gamma contamination. Isolated spots in almost every cell exceed 500,000 dpm/100 sq cm, and direct alpha and beta-gamma dose rates in one cell exceed 400 mrad/h. Samples from the cell walls and floors indicate the presence of significant transuranic contamination. Dose rates in the canal range from 1 to 100 rad/h, and the dissolver pit walls are also heavily contaminated with alpha and beta-gamma emitters. The buried waste tanks are known to be internally contaminated. Radionuclide inventories of the Metal Recovery Facility are estimated at 10 Ci of Sr-90 and Cs-137 and 1 Ci of Pu-238, Pu-239, and Pu-240. Approximately 13,414 cubic ft (380 cubic m) of liquid radioactive waste and 11,654 cubic ft (330 cubic m) of solid radioactive waste is expected to be generated during decontamination of this facility. Approximately half of this waste has been disposed of.

DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

ID Number: 1A.8

Facility Name: Storage Garden—(3033)

Location of Unit: This storage area is located just north of Building 3033 at ORNL. ORNL grid coordinates are N 22,660 and E 31,670.

General Dimensions and Capacities: The storage area consists of seven buried stainless steel cylinders (or wells) about 1 ft (0.3 m) in diameter and 5 ft (1.5 m) long, set in concrete with about 0.25 in. (6.3 mm) extending above ground level.

Function: Sealed radioactive sources, miscellaneous contaminated items, and irradiated targets prior to processing were stored in this location.

Dates of Operation: Site commissioned: 1956.
Taken out of service: 1975.

Waste Characteristics: No information about the specific wastes is available.

Release Data: No stored radioactive materials or radiation sources remain in any of the seven wells. Beta-gamma dose rates on the interior of the steel wells range from <0.1 to 40 mrad/h, with measured transferable contamination levels from <200 to 9,400 dpm/100 sq cm. About 71 cubic ft (2.0 cubic m) of solid waste will be generated during decontamination of the facility.

DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

ID Number: 1A.9

Facility Name: Strontium-90 Power Generators—(3028)

Location of Unit: Four Sr-90 thermoelectric generators identified as Sentry, SNAP-7B, SNAP-7C, and SNAP-7D are stored at ORNL. SNAP-7D is stored in Building 3001 (N 22,570 and E 31,190) and the other three are stored outdoors in a staging area south of Building 3047.

General Dimensions and Capacities: Each unit consists of one or more welded strontium titanate sources inside a shielded thermoelectric device.

Function: The unit is designed for storage.

Dates of Operation: Early 1960s.

Waste Characteristics: Primary waste is Sr-90. The Sr-90 is contained in sealed thermoelectric generators.

Release Data: The current Sr-90 inventories of these generators are Sentry, 8,895 Ci; SNAP-7B, 119,480 Ci; SNAP-7C, 20,260 Ci; and SNAP-7D, 117,470 Ci.

DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

ID Number: 1A.10

Facility Name: Waste Evaporator Facility—(3506)

Location of Unit: The Waste Evaporator Facility is located at ORNL in Building 3506. ORNL grid coordinates are N 22,000 and E 30,800.

General Dimensions and Capacities: The facility consists of a reinforced concrete cell with underground piping, a valve pit, and an attached wood-framed operating area.

Function: The Waste Evaporator Facility was used for concentration and volume reduction of the liquid waste prior to its final disposal in excavated pits and trenches.

Dates of Operation: Site commissioned: 1949.
Taken out of service: 1954.

Waste Characteristics: The volume and composition of waste handled by the LLW collection and transfer system has varied along with R&D activities during the operating history of ORNL. No routine effort was made to determine the composition of the waste streams. Most sources generate dilute LLW at the mCi/gal level, although wastes containing up to 20 Ci/gal were produced in certain operations and diluted to around 0.05 Ci/gal before entering the collection system. It has been estimated that the average activity of LLW is about 30 mCi/gal. The major radionuclides present are Sr-90, Cs-137, Ru-106, Co-60, and various rare earths. Some plutonium, uranium, and TRU isotopes are also present. Wastes are generally nitrate solutions, although acid chlorides or other corrosive wastes were also generated. Wastes were normally neutralized prior to evaporation and tank storage.

Release Data: The structure developed leaks around cell blocks on the roof, and all miscellaneous debris and material were removed and buried. Water from the leaks was pumped from the floor to process drains. These leaks are currently being repaired, and the building is not being used. Contaminated pipe chases and surplus support equipment associated with the previous evaporator operations exhibit dose rates up to 10 mrad/h, with transferable surface contamination of several thousand dpm/100 sq cm. Curie levels of activity remain in the abandoned valve pit on the north side of the cell and the fixed contamination in the cell floor. Estimated exposure rates in these areas are 1–100 R/h. Soil in the vicinity of the site is also contaminated. About 645 sq m (6,901 sq ft) of solid radioactive waste and 30 sq m (321 sq ft) of liquid radioactive waste will be generated during the decommissioning of this facility.

DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

ID Number: 1A.11

Facility Name: Ceramic Processing Laboratory—(4508)

Location of Unit: This facility is located in the Room 139 complex of Building 4508 of the main ORNL complex. ORNL grid coordinates are N 21,580 and E 32,030.

General Dimensions and Capacities: No information.

Function: No information.

Dates of Operation: 1960 to present.

Waste Characteristics: The inventory at this site has been estimated at less than 1.0 Ci (composed of Th-232, U-232, and U-233) and << 1.0 kg due to polynuclear aromatic hydrocarbons.

Release Data: No reported releases.

DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

ID Number: 1A.12

Facility Name: High-Level Chemical Development Laboratory—(4507)

Location of Unit: This facility is located in Building 4507 of the main ORNL complex. ORNL grid coordinates are N 21,800 and E 32,135.

General Dimensions and Capacities: This facility contains four hot cells and associated equipment for handling highly irradiated alpha-beta-gamma sources on the ground level and a chemical make-up area on the second level. The building is also equipped with a penthouse superstructure above the hot cells that contains glove boxes, a shielded manipulator cave for small-scale work, and a gantry crane for handling shielded casks.

Function: This laboratory was constructed to be used as a small-scale pilot plant laboratory for conducting research on reactor fuel reprocessing. The facilities in Building 4507 have been used in development studies on fuels, separation and recovery of transuranic isotopes, and separation of fission products during the 1960s and 1970s.

Dates of Operation: Date constructued: 1957.
Taken out of service: 1980.

Waste Characteristics: The inventory of transuranium radionuclides at this site has been estimated to be less than 1,000 Ci.

Release Data: Research activities were terminated in 1980, and the building was subsequently placed in its present mothballed condition.

DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

ID Number: 1A.13

Facility Name: Remote Coating Furnace Loop—(4508)

Location of Unit: This facility and associated support equipment is located in room 265A of Building 4508 of the main ORNL complex. ORNL grid coordinates are N 21,580 and E 32,030.

General Dimensions and Capacities: Equipment associated with this facility, with the exception of the controls and instruments, is contained in a transparent plexiglass enclosure of approximately 19 sq ft (1.8 sq m).

Function: The Remote Coating Furnace Loop was used to prepare coated-particle fuels for the High Temperature Gas-Cooled Reactor fuel refabrication cycle.

Dates of Operation: Site commissioned: 1960s.
Taken out of service: 1980.

Waste Characteristics: Primary wastes are U-238 and Th-232.

Release Data: The maximum transferable contamination levels within the enclosure are less than 5,000 dpm/100 sq cm alpha, and the maximum background levels are less than 10 mR/h. Radiation measurements within the furnace loop were less than 600 dpm/100 sq cm alpha. Standard decontamination procedures should be sufficient for handling the coating equipment.

DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

ID Number: 1A.14

Facility Name: Transuranium Research Laboratory 45 (5505)

Location of Unit: This facility is located in Room 45 of Building 5505 at ORNL. ORNL grid coordinates are N 21,320 and E 33,280.

General Dimensions and Capacities: Building 5505 contains 16 laboratories; Room 45 is about 24 × 48 ft (7 × 15 m) and contains 13 surplus glove boxes.

Function: Room 45 was used to provide a central holding area for radionuclides and to provide additional security and accountability for special materials.

Dates of Operation: Site commissioned: 1967.
Site is still in use as equipment storage area.

Waste Characteristics: Transuranic waste is the principal waste.

Release Data: Equipment contained within this room is relatively free of external transferable contamination; however, most of the surplus equipment does contain signficant levels of radioactivity internally. The 13 portable glove boxes in Room 45 have no external transferable contamination greater than 20 dpm/100 sq cm alpha or 200 dpm/100 sq cm. Maximum radioactivity of ~4 mR/h was measured at the glove boxes. Alpha contamination within the glove boxes varies considerably, with levels ranging from 1,000 dpm/100 sq cm to an approximate maximum of 1,000,000 dpm/100 sq cm. Environmental risks are minimal because of the inherent ventilation-filtration system in Building 5505 and glove boxes being operated at a greater negative pressure than the surrounding laboratories.

DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

ID Number: 1A.15

Facility Name: High Level Radiation Analytical— (Building 3019-B)

Location of Unit: The analytical facility is located at the intersection of Third Street and Hillside Avenue. ORNL grid coordinates are N 22,550 and E 30,800.

General Dimensions and Capacities: The facility measures approximately 36 by 64 ft (11 by 19.5 m) and contains seven manipulator-equipped hot cells and a centrally located storage cell.

Function: The facility was used to perform chemical analyses on highly radioactive materials in support of ongoing ORNL program. The hot cells contained sampling, handling, preparation, and analytical equipment to conduct a wide variety of chemical analyses.

Dates of Operation: Site was in operation from 1955 to 1980.

Waste Characteristics: The hot cells contain residual contamination of radionuclides from past operation, including Sr-90, Cs-137, and TRU materials. No accurate estimate of Ci content is currently available.

Release Data: No reported leaks or releases.

DATA SUMMARY SHEET

WAG ID Number: 1.0

WAG Name: Main Plant Area

ID Number: 1A.16 -

Facility Name: Oak Ridge Research Reactor—
Heat Exchangers (Site 3087)

Location of Unit: The heat exchangers are located southwest of the intersection of Northside Drive and First Street. ORNL grid coordinates are N 23,000 and E 31,660.

General Dimensions and Capacities: The facility consists of seven water-to-air heat exchangers measuring 20 by 20 ft (6 by 6 m) each. The exchangers are located adjacent to each other above a concrete pad measuring 25 by 180 ft (7.6 by 55 m).

Function: The units formerly provided the primary cooling for the Oak Ridge Research Reactor prior to being replaced by a cooling tower.

Dates of Operation: Site was in operation from 1959 to 1961.

Waste Characteristics: The heat exchangers' tubes are internally contaminated with Cs-137, Co-60, Cr-51, and Ce-144. No accurate estimate of Ci content is currently available.

Release Data: No reported leaks or releases.

DATA SUMMARY SHEET

WAG ID Number: 8.0

WAG Name: Melton Valley Area

ID Number: 8A.1

Facility Name: Molten Salt Reactor Experiment (MSRE)—(7503)

Location of Unit: The site is located on Melton Valley Drive, about 0.6 mile (1.0 km) south of the main ORNL complex. See ORNL grid coordinates N 18,670 and E 32,725.

General Dimensions and Capacities: The facility includes an 8-MW (thermal) fluid-filled reactor, an LLW pumping station, an LLW collection tank, and a filter house (Building 7511).

Function: The reactor was constructed to demonstrate the molten-salt breeder concept for commercial power generation.

Dates of Operation: Site commissioned: 1965.
Taken out of service: 1969.

Waste Characteristics: Wastes from the site are radioactive salts and flush salts. Radioactive wastes are Sr-90, Cs-137, Y-90, and Ba-137. Co-60 has also been detected.

Release Data: Total radioactivity measures 35,800 Ci (estimated). No site contamination concerns outside of Building 7503 other than the filter pit area have been identified. Potential chemical toxicity of the fuel and flush salts is recognized and will be considered during final decommissioning.

DATA SUMMARY SHEET

WAG ID Number: 9.0

WAG Name: Homogeneous Reactor Experiment (HRE) Area

ID Number: 9A.1

Facility Name: Waste Evaporator—(7502)

Location of Unit: The reactor is located in Building 7502 on Melton Valley Road, 0.6 mile (1.0 km) southeast of the main ORNL complex. ORNL grid coordinates are N 18,730 and E 31,450.

General Dimensions and Capacities: The site contains the reactor (Building 7500), the waste evaporator (Building 7500), a hot storage and decontamination pad, and a filled-in waste holding pond.

Function: The facility was intended for three phases of experimentation. Due to accelerated corrosion during the first experiment, the second and third experiments were never begun.

Dates of Operation: Site constructed: 1951.
Site commissioned: 1958.
Taken out of service: 1961.

Waste Characteristics: Wastes from the site are Cs-137, Sr-90, and Co-60.

Release Data: Some alpha contamination is expected in the reactor pit from residual fuel. No alpha contamination was found in any accessible area surveyed. Direct beta-gamma readings in the reactor cell could be as high as 600 rad/h. The evaporator cell, chemical processing cell C, and the storage pool also provide a small probability for significant exposure. An estimated 30–40 kg of highly radioactive insoluble corrosion and fission products remain in the process piping. The filled-in waste retention pond is estimated to contain between 100 and 500 Ci of buried radioactivity.

DATA SUMMARY SHEET

WAG ID Number: 15.0

WAG Name: ORNL Facilities at Y-12

ID Number: 15A.1

Facility Name: Decontamination—(9419-1)

Location of Unit: This facility is located in the southeast portion of the Y-12 complex in Building 9419-1.

General Dimensions and Capacities: The facility is housed in a 6 × 9 m (20 × 30 ft) building. The facility also includes an outdoor concrete-walled pit 4.2 × 4.3 m (14.0 × 14.0 ft) that is uncovered and connected to Building 9419-1 and East Fork Poplar Creek by drain lines. The drain lines are between 65 and 82 ft (20 and 25 m) from Building 9419-1 and East Fork Poplar Creek, respectively.

Function: The facility was primarily a steam-cleaning facility.

Dates of Operation: Site commissioned: Mid 1960s.
Taken out of service: Early 1970s.

Waste Characteristics: The primary contaminant is Th.

Release Data: No releases reported.

DATA SUMMARY SHEET

WAG ID Number: 15.0

WAG Name: ORNL Facilities at Y-12

ID Number: 15A.2

Facility Name: Contaminated Attic Area—(9204-1)

Location of Unit: The contaminated area is located on the second level of Building 9204-1 at the Y-12 Plant. The contamination is confined to paint used to fix earlier contamination of the ceiling area. The contamination is confined to the original ceiling and beams (which are still partially covered with the paint) and the top of the false ceiling (which contains flakes of the paint).

General Dimensions and Capacities: The total attic area marked as a contamination zone is about 59 × 79 ft (18 × 24 m).

Function: No specific function.

Dates of Operation: No information.

Waste Characteristics: The specific isotopes contaminating this area are unknown.

Release Data: Transferable alpha levels in the area ranged between 10 and 275 dpm/100 sq cm, with an average level of 20 dpm/100 sq cm. The maximum beta-gamma level was 50 cpm (<1 mR/h).

DATA SUMMARY SHEET

WAG ID Number: 15.0

WAG Name: ORNL Facilities at Y-12

ID Number: 15A.3

Facility Name: Contaminated East End Basement—(9204-1)

Location of Unit: The site has two adjacent areas (separated by a 3.2-ft [1-m] concrete walkway) that are located in the basement crawl space of the east end of Building 9204-1 at the Y-12 Plant.

General Dimensions and Capacities: Both areas are dirt floors that are approximately 25 × 25 ft (7.5 × 7.5 m).

Function: No specific function.

Dates of Operation: No information.

Waste Characteristics: The source of contamination at this site is unknown. One possible explanation for the contamination is a pump leaking a uranium solution through the floor above the dirt.

Release Data: Contamination was with low-level alpha emitters (alpha radiation levels of up to 2,000 dpm/100 sq cm). No beta-gamma radiation was detected. Although the depth of soil contamination has not been verified, the present estimate is that removal of 6 to 8 in. (15 to 20 cm) of soil would be necessary to remove the contamination. A background beta-gamma level of 300 cpm (<1 mR/h) from process pipes located approximately 5 ft (1.5 m) above the dirt floor areas was reported. The maximum contact level is 2,000 cpm (<1 mR/h). Surface water and groundwater contamination are the primary environmental concerns for this area.

DATA SUMMARY SHEET

WAG ID Number: 15.0

WAG Name: ORNL Facilities at Y-12

ID Number: 15A.4

Facility Name: Storage Tank—(9201-3)

Location of Unit: The storage tank is located in a mezzanine room in Building 9201-3 at the Y-12 Plant.

General Dimensions and Capacities: This glass-lined steel tank has a capacity of 3,000 gal (11,356 L).

Function: The tank was used to hold cutting oil for a machine shop.

Dates of Operation: Site commissioned: 1958.
Taken out of service: 1969.

Waste Characteristics: The tank is slightly alpha contaminated (4,000 dpm/100 sq cm) but is fixed with a coating of paint on the exterior.

Release Data: The tank is located in a room designated as a contaminated area because of existing low-level alpha contamination at the room's entrance.

DATA SUMMARY SHEET

WAG ID Number: 15.0

WAG Name: ORNL Facilities at Y-12

ID Number: 15A.5

Facility Name: Radioisotope Processing Facility (Beta Cubicle)—9204-3

Location of Unit: The site is located in Building 9204-3 at the Y-12 Plant. It is found on the center of the second floor of the building.

General Dimensions and Capacities: The facility consists of the remnants of a power supply and controls enclosed in a steel structure about 16 × 4 × 12 ft (5 × 1.2 × 3.6 m).

Function: The cubicle was used in the 1940s in support of activities in Building 9204-3.

Dates of Operation: Site commissioned: Not known.
Taken out of service: Early 1950s.

Waste Characteristics: Measurements show no transferable contamination (20 dpm/100 sq cm alpha and 200 dpm/100 sq cm beta-gamma) to be present. PCBs were detected but have been removed.

Release Data: No radioactivity was found during probing of the equipment. The cubicle is presently brown tagged, indicating no radioactivity on the surfaces but that all surfaces cannot be inspected because of their configuration.

DATA SUMMARY SHEET

WAG ID Number: 15.0

WAG Name: ORNL Facilities at Y-12

ID Number: 15A.6

Facility Name: Radioisotope Processing Facility (Curium Handling Glovebox)—9204-3

Location of Unit: The glovebox is located in an enclosed area on the second floor of Building 9204-3.

General Dimensions and Capacities: Measurements are 3 × 5 ft (1 × 1.5 m).

Function: The glovebox was used to support curium operations in the 9204-3 area.

Dates of Operation: Site commissioned: late 1960s.
Taken out of service: mid 1970s.

Waste Characteristics: The interior of the glovebox is reported to be very contaminated because of curium processing operations.

Release Data: Detected radiation levels are >500,000 dpm/100 sq cm alpha (internal). External levels are <2 mR/h, and transferable contamination levels are <5,000 dpm/100 sq cm alpha.

DATA SUMMARY SHEET

WAG ID Number: 15.0

WAG Name: ORNL Facilities at Y-12

ID Number: 15A.7

Facility Name: 86-Inch Cyclotron—(9201-2)

Location of Unit: The Cyclotron Facility was constructed in Building 9201-2 at the Y-12 Plant.

General Dimensions and Capacities: Specific data are not available, but the facility occupies one-third of Building 9201-2 at the Y-12 Plant.

Function: The cyclotron was dedicated to the production of radionuclides used in medical diagnosis, as trace elements in coal liquefaction and gasification studies, and for treatment of coronary diseases.

Dates of Operation: Site commissioned: 1950.
Taken out of service: 1983.

Waste Characteristics: Wastes are comprised of Bi-207, Co-57, Ga-67, Zn-65, Cd-109, Ag-110, and Y-39.

Release Data: The external surfaces of the cyclotron emit a maximum radiation level of 70 mR/h with transferable contaminations of <300 dpm/100 sq cm of beta-gamma and <20 dpm/100 sq cm alpha. It is estimated that 10 Ci of activity are in the vacuum pumps and oil. Another 100 Ci may be present from residual quantities of radionuclides from reactions of the cyclotron beam with the targets. Lead shielded stainless steel shipping casks and storage bins contain abandoned targets with a radiation level of <40 mR/h, and 10 to 30 mCi of Bi-207 may be stored in the cyclotron pit. Magnet cooling coils contain approximately 7,000 gal (26,500 L) of transformer oils that contain less than 50 ppm PCBs.

DATA SUMMARY SHEET

WAG ID Number: 15.0

WAG Name: ORNL Facilities at Y-12

ID Number: 15A.8

Facility Name: Plutonium Process Condensate Tank—(9204-3)

Location of Unit: The tank is located south of Building 9720-8 at the Y-12 Plant.

General Dimensions and Capacities: The steel tank has a volume of 500 gal (1,892 L).

Function: The tank was used in the 1950s and 1960s to transport plutonium process condensate from Building 9204-3 to ORNL for disposal.

Dates of Operation: Site commissioned: 1950s.
Taken out of service: 1960s.

Waste Characteristics: The primary waste is Pu.

Release Data: It has been determined that the interior is contaminated with radiation levels of 500,000 dpm/100 sq cm alpha. The exterior has been protected with an application of paint sealant. The transferable contamination of the exterior tank is less than 30 dpm/100 sq cm alpha and less than 200 dpm/100 sq cm beta-gamma. Radiation exposure at the exterior surface is less than 1 mR/h.

DATA SUMMARY SHEET

WAG ID Number: 15.0

WAG Name: ORNL Facilities at Y-12

ID Number: 15A.9

Facility Name: Plutonium Processing Facilities—(9204-3)

Location of Unit: The Plutonium Processing Facility is located in Building 9204-3 in Room 116.

General Dimensions and Capacities: Room 116 consists of an L-shaped glovebox designed to isolate aspects of the plutonium processing operations by enclosing a portion of the room.

Function: The function of the facility is to process plutonium.

Dates of Operation: Site commissioned: early 1950s.
Taken out of service: early 1960s.

Waste Characteristics: Wastes are primarily Pu-240 and Pu-242.

Release Data: Both the equipment and box components are highly contaminated with detectable radiation levels greater than 500,000 dpm/100 sq cm alpha. No transferable contamination was detected on external surfaces, except at the bottom of the enclosure where the radiation level is less than 2 mR/h.

DATA SUMMARY SHEET

WAG ID Number: 15.0 WAG Name: ORNL Facilities at Y-12

ID Number: 15A.10 Facility Name: Coolant Salt Technology Facility—(9201-3)

Location of Unit: This facility is located near the MSRE Fuel Handling Facility on the second floor of Building 9201-3 of the Y-12 complex.

General Dimensions and Capacities: This facility consists of a flow loop system.

Function: This facility was used to inject tritium into a boron trifluoride flow in support of the MSRE.

Dates of Operation: 1958 to 1969.

Waste Characteristics: No information.

Release Data: The only residual radioactivity is located in the piping and valves located on the external surfaces of the facility. Radiation levels ranging up to 40,000 dpm/100 sq cm alpha are present, with transferable levels of approximately 1,000 dpm/100 sq cm alpha and 3,500 dpm/100 sq cm beta-gamma.

DATA SUMMARY SHEET

WAG ID Number: 15.0

WAG Name: ORNL Facilities at Y-12

ID Number: 15A.11

Facility Name: MSRE Fuel Handling Facility—(9201-3)

Location of Unit: This facility is located in Room 235 of Building 9201-3 at the Y-12 Plant.

General Dimensions and Capacities: The MSRE Fuel Handling Facility is a cell about (16 × 16 ft) × 3 levels high (5 × 5 m).

Function: The MSRE Fuel Handling Facility was used in fuel preparation for the MSRE.

Dates of Operation: Site commissioned: Information not available.
Taken out of service: 1969.

Waste Characteristics: Primary radiological wastes are U-233 and Th-228.

Release Data: The cell is generally contaminated throughout, including the floors, sink, piping, and ductwork. Radiation surveys completed on August 7, 1985 indicated probe readings ranging from 5,000–50,000 dpm/100 sq cm alpha and transferable levels of 1,236 dpm/100 sq cm alpha and 3,500 dpm/100 sq cm beta-gamma.

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